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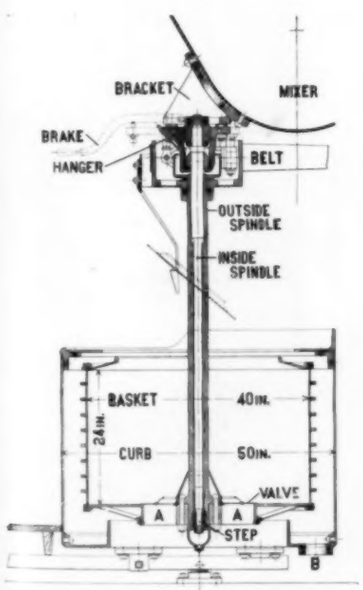

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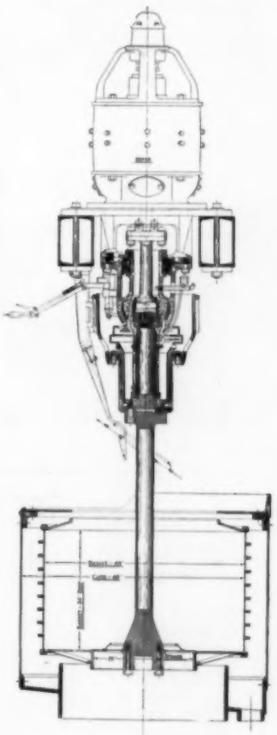

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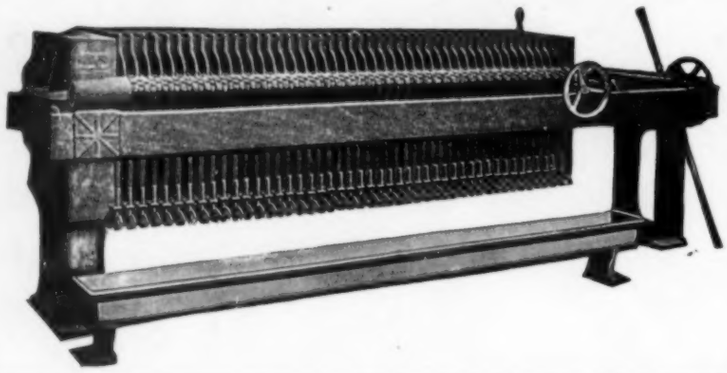

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CHEMICAL & METALLURGICAL ENGINEERING

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H. C. PARMELEE
Editor

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The Opportunity Of Industry

THIS is addressed to the industries—the chemical engineering industries—manufacturing not only chemicals and products obviously chemical in character, but also products in which chemical engineering plays, or should play, a conspicuous part, such as sugar, paper, cement, rubber, leather, paint and varnish.

Two weeks ago we pointed out the responsibility of the technical school for industrial progress by training potential chemical engineers ready to enter any one of a score of industries. This is only half the picture. For what shall it profit an industrial nation if trained technologists are produced at the rate of a thousand a year only to find no market for their talents, no outlet for their ability, initiative and genius?

Complementary to the responsibility of the college is the opportunity of industry; for the minute the college has discharged its responsibility and turned out its product, a new opportunity is offered to industry to increase efficiency, improve quality, cut costs and otherwise enhance industrial production. A new opportunity is offered to bring technical blood into the organization, to displace rule of thumb with the exact methods of science and engineering and to gain a lap on competitors.

Chem. & Met. visualizes in the chemical engineering industries a group in which chemical technology plays a leading if not the most important part; a group of industries in which progress in the near future will be made by reliance on research and close technical control. All of these industries are not equally alive to their opportunity in absorbing the graduates of our technical schools. The significant fact is that the progressiveness, stability and prosperity of these industries is almost directly proportional to the extent to which they have been put on a scientific basis—the degree to which they have absorbed technical knowledge and skill in the shape of young engineers. The moral is plain to those at the bottom of the list.

First in rank come the strictly chemical industries, the manufacturers of heavy and fine chemicals, explosives, dyes and coal byproducts. Even in these industries the technical man has not always governed production, but with progress and competition he became an essential element. In a second group are to be found those great industries the products of which are not chemical but in which chemical engineering processes are used for the efficient production of such important commodities as sugar, paper, soap, gasoline, rubber and cement. Technology is rapidly penetrating these industries to their great advantage; not in the same degree in every case, but to such an extent that the plant that still believes in rule of thumb is the exception. Finally, there are those old-established industries for the manufacture of ceramic products, leather, paint and varnish, in which technology is decidedly subordinate to the empirical methods that have prevailed for centuries. Here the exception is the plant that is on a scientific basis and under technical control and has recognized the potential value of the technical graduate.

To one and all of these industries we commend the product of our technical schools. Technical men will not prove a panacea for all industrial ills nor should they be given too free a rein, especially in those industries that have a long and successful history of empirical operation. The young engineer himself will have much to learn from these. But on the whole industry will benefit from the penetration of chemical engineering into its production department and even into management, purchasing and selling. The extent to which advantage is taken of this opportunity will be at least one index and measure of progressiveness.

"Old King Coal Was A Dirty Old Soul"

THERE is nothing particularly novel in a restatement of the advantages of oil over coal as a fuel for many of our industries. Its cleanliness and convenience of operation are already well known. Next to electricity oil is the most easily controllable source of heat. Unlike coal, it varies little in heat value and for the same output of B.t.u. it weighs 30 per cent less than coal and occupies 50 per cent less space. Its action is quick, intense and effective.

But in the face of advantages so great and so apparent, why is it that the industrial application of oil burning has proceeded so slowly? Does the difficulty lie with the oil refiner, the burner manufacturer or with the consuming industries? Apparently the blame must be shared by all of them. The oil industry—notwithstanding the fact that in point of volume fuel oil makes up almost 50 per cent of the production from crude oil—has only recently given any serious attention to developing the superior uses of this form of industrial fuel. In fact in some instances it has actually retarded the development by its repeated stories of "an oil famine" and possible interruption of supply. The problem has been regarded as too large for an individual refining company to attempt single handed, especially since its solution might very likely mean the building up of a business to be taken away later by a price-cutting competitor.

The fuel requirements of the different industries are so complex as to require a more elaborate engineering staff than the average oil refiner could afford to maintain for this purpose. To be sure, this expense and service might have been shared through some cooperative arrangement with the burner manufacturers, but unfortunately that group is of too recent origin

and too absorbed with its own development problems to help carry much of the larger burden. Accordingly the brunt of the development work has fallen to the industries themselves. With no place for them to turn for help, they have had to work out their own fuel problems as best they could. In very few instances were real engineering skill and experience available. Some installations in which other fuels were replaced by oil failed simply because of a lack of knowledge of the fundamental properties of the oil itself. Specifications were not available or could not be interpreted in terms of the industry's particular problem. Other installations could trace their troubles to the burners and the actual equipment for making the heat available.

An industry that to our knowledge has had its difficulties in introducing oil burning is varnish making. Since time immemorial varnish kettles have been heated over open coal or coke fires and it is only recently that oil or gas has been regarded as even a possible competitor. Both of the latter, however, are now in successful use in modern plants. A deterring factor in the case of at least one oil-burning system for varnish cooking proved to be the inability to obtain a refractory lining for the combustion chamber that would withstand the intense action of the projected flame. Not until this problem was solved by expensive experimenting on the part of the user was this system of oil burning put on a competitive basis with other forms of heating in this industry.

These difficulties or others similar to them have doubtless been met in the experience of industries such as glass, ceramics, lime, sugar, oil and metal products that have been among the first to recognize the advantages of fuel oil. If through the technical press this experience can be shared with other industries less successful in solving their fuel problems and if through co-operative organization the oil refiners and burner manufacturers can be induced to give their support to the developing process, it is practically certain that oil will become increasingly important as an industrial fuel. In fact Old King Coal may well prepare for a rebellion, in some quarters at least, against the high-handed methods and the atmosphere of dirt and contamination that have long characterized his reign.

Progress and The Convention Idea

"CONVENTIONS," said Bruce Barton in a magazine editorial, "are the second largest industry in America." There is so much truth in the statement and so little fiction that the subject may well deserve some thought. As a special phase of the general subject, the recent convention of the National Lime Association may serve as an example.

Previous meetings had been held in large cities like Cleveland and New York. This time White Sulphur Springs was selected. The sound philosophy behind this move was to get the members to play together. It is much easier to work with a competitor for the good of the industry if one has finessed his king or listened to his good natured banter on your mashie shot out of the trap on the eighth hole. It is much harder to pick a fight with a competitor if you have loafed around in the sunshine together.

Of course professional societies such as the American Institute of Chemical Engineers prefer to convene near an industrial center, and a society as large as the American Chemical Society is forced to stay in or near cities that can accommodate a thousand and more visitors. But with trade associations, national in their scope and importance, representing vital industries, the thing most to be fostered and encouraged is mutual friendly feeling among members. Thus far in the world's history nothing has been discovered that will produce this gentle lubricant so effectively as play. In the interest of efficiency and progress, then, we can probably stand more play, particularly at conventions of trade and industrial bodies.

Insurance of Chemists And Evaluation of Heroism

A RECENT incident, in which a chemist engaged on important research was killed by an explosion in his laboratory, draws attention to the unobtrusive heroism that plays so important a part in the advance of civilization—the determination of the scientist to "do or die." This heroism, however, is not of the trumpeted kind. Few are aware of the extent to which risks are taken in the laboratory, the personal injuries that are received, before certain classes of chemical research can be brought to a successful conclusion, before industry and society can reap the benefit that comes from "divine curiosity"—a phrase that has been used to define the word science.

For long it was considered that heroism connoted a feat of arms, but it has remained for the technician, more particularly the chemist, to demonstrate that, imperfect and inadequate though the estimate may be, a money value can be placed on the outcome of research which may represent the hazard that exists; or, conversely, an equivalent sum is needed to reimburse the sponsors in the event of fatal accident and a sudden termination of the work. Such a dislocation of plans is a serious matter if a scientist of specialized knowledge and broad experience is placed in charge of the work; for he alone knows the trend of the research—the details of past progress and the lines of least resistance to be followed to insure success. Moreover, he alone can distinguish between the essential and the non-essential developments that have occurred; and he alone has the faith and enthusiasm to follow a trail that to him appears to be leading in the right direction, whereas a stranger would probably favor concentration of research along other paths. Continuity in such work is of primary importance, but it is also essential that benefit be derived from the zeal of the scientist who first mapped out the program of experimentation. It is an easy matter to discourage a scheme of research or kill a process proposed or developed by another. Hence the death of a chemist in the midst of his researches involves a deplorable and irremediable loss; and financial sponsors of such research are adopting business principles and insuring the lives of technicians who are engaged in research of a hazardous nature.

The incident to which mention was made in a previous paragraph was one with which we happened to be in comparatively close touch. The chemist, a man of unremitting zeal, prosecuted his researches to the point where serious accident occurred, in consequence of which he was invalided in hospital. This first seri-

ous setback left unmistakable marks of physical impairment, sufficient to have deterred those of less determination from continuing the task. But finality had to be reached, and he plunged afresh into the fascination of the work. Realizing the hazard, he took out adequate personal life insurance; his financial sponsors, having invested in anticipation of promised outcome, were negotiating for an insurance of $300,000 when an unexplained accident terminated the chemist's career and abruptly stopped the work he was doing. After all, it is significant of the worth of the inventor of ordinary standing if his brain can be valued for insurance for so comparatively great a sum. It offers proof of the serious hazard that is being accepted bravely and unostentatiously by so many chemists, a hazard that connotes a heroism to science that seldom or never obtains public recognition.

The Paternalistic Attitude Of the Employer

IT has frequently been a cause of comment that many executives fail to appreciate employee psychology. A case in point is the manner of offering such things as education, insurance policies, medical service and recreation to employees. Employers or executives have in many cases risen from the ranks and are usually energetic, popular men endowed with the ability to lead. It is therefore strange that in dealing with employees as a group they should suddenly lose perspective.

Suppose the president of a corporation is planning to take out group insurance for his employees. It is a progressive, far-sighted thing to do. It tends to make an employee continue his service with a company. It cuts down labor turnover. And it is with such arguments as these that the executive would convince the board of directors or the stockholders that the idea is essentially a good one. He then proceeds to make the announcement to his employees, but it is in a different vein. The benefits to the employees and the altruism of the corporation in making such a gift are the things emphasized.

It is a mistake not to credit employees with sufficient intelligence to see through this. In our experience we have never yet discovered a group that was thoroughly convinced of the unselfishness of the company. Many of them see the proposition in the true light of mutual benefit. Some are amused, some are irritated, some are outraged at the assumption of virtue by the company. Would it not be more respectable to address the employee with frankness and honesty somewhat as follows:

"You will readily understand that it is of great advantage to a company to keep the same men in its employ. Every man that stays means that one less man has to be broken in on a new job. It means that the workers will become more of a team and work better together.

"In the hope that it will create an additional incentive for you to stay with us, we have subscribed to a group insurance plan for our employees. Under this plan a man will be insured for $500 after he has been with the company for a year. This amount increases year by year reaching a maximum after 20 years of service.

"We believe that this plan will work to our mutual advantage and we hope it will appeal to you."

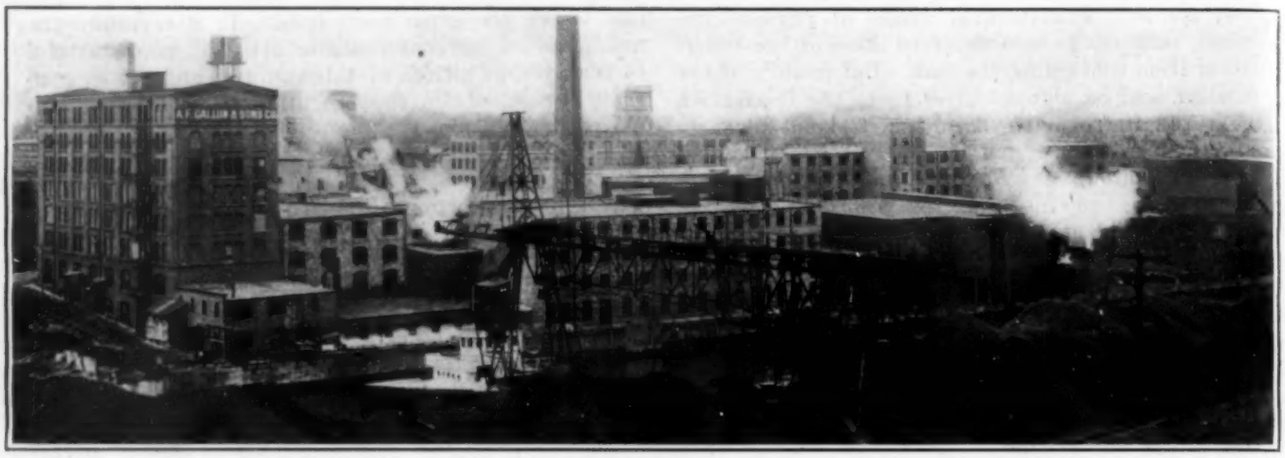
It is possible that we are mistaken, but we should like to see the experiment tried. It is certainly the antithesis of the paternalistic attitude so distasteful to the average citizen of this country, and yet so generally practised by the executive in addressing employees as a group.

The Chemistry of Bleaching And Finishing Cotton Fabric

IT IS interesting to recall that, up till almost the end of the eighteenth century, the bleaching of cotton fabric was closely allied to agricultural pursuits. Plant ashes were used for the preparation of the lye in which the goods were first steeped; buttermilk was used for "souring," and exposure to the sun in fields for several weeks completed the bleach, the final phase of operations, known as "grassing," necessitating the use of immense areas of land. At that time, hydrochloric acid gas was a troublesome byproduct of chemical plants. It contaminated the atmosphere; and, when discharged into canals, caused the nails in the barges to corrode. Then came the application of science to industry—the utilization of hydrochloric acid to make chlorine, which, combined with lime as bleaching powder, replaced the "grassing" process, thus saving time and releasing agricultural land for more appropriate and more remunerative purposes. Late eighteenth century advance in science transferred bleaching from the domain of the rule-of-thumb arts, dependent to a large extent on agriculture, yet restricted its logical expansion, to the status of a chemical process, dependent on primary chemical products for its successful operation.

These and other interesting historical facts are recalled by S. H. Higgins in a recent issue of the Manchester *Guardian Commercial*. The components of raw cotton are of complex character, and it is only in comparatively recent years that processing has been studied from the standpoint of colloidity and adsorption. Present-day knowledge is by no means complete, and results at times are so unexplainable by known laws that the worker can shroud his operations behind a smoke screen of secrecy and an air of mystery. The deterioration of cotton goods during storage is a subject that has attracted attention, and it is interesting to note that research has demonstrated that the nitrogeneous constituents of the cotton are not responsible, as there is little chance of these being present after bleaching. Luster, according to Dr. J. C. Withers, of the Shirley Institute, depends almost entirely on the shape of the cross-section of the cotton fiber, maximum luster being obtained when it is circular. This change of shape, it is maintained, is the function of mercerizing, a view that is supported by the fact that treatment under tension is desirable if maximum effect is desired. However, the true circular section has not yet been observed by microscopic test, and empirical knowledge suggests that the best results from the invention of Mercer are yet to be obtained.

A field for research appears to exist in the determination of the exact cause of the luster produced by mercerizing, in connection with which opinions are divided; and, although definite knowledge of the mechanism of the change may appear to be of academic interest only, it is more than probable that additional information would aid the technologic advance of the art.



Applied Research Pays Dividends in Leather Manufacture

Successful Production of Russia Calf, a Vegetable-Tanned Calf Leather Used for the Uppers of High-Grade Shoes, Is Dependent Upon Ability to Apply Fundamental Data

By Alan G. Wikoff
Assistant Editor, *Chem. & Met.*

ONE of the best types of leather for shoe uppers, but most difficult to make satisfactorily, is the vegetable-tanned leather known as Russia calf. Because of the manufacturing difficulties, steady producers of this grade of leather have always been few in number, and years ago one firm through careful study and co-ordination of operating details became firmly established as the leader in this industry. In spite of the success that attended these keen practical observations, it was recognized that continued progress would depend upon more fundamental data than it was possible to obtain without scientific training.

This appreciation of the value of science, unflinching in the face of many disappointments, is now reflected in the finest system of scientific control to be found anywhere in the leather industry. As a result, the firm in question, the A. F. Gallun & Sons Co., of Milwaukee, has practically eliminated competition in its field and acquired a virtual monopoly in this country. Such an achievement should be an inspiration to all who are facing similar problems and it is hoped that the following outline may convey some measure of the spirit of this organization.

Toward the fundamental data that have been developed in its completely equipped laboratories, the company has adopted the broad-minded policy of permitting free publication; more than fifty scientific contributions have emanated from this source during the past 10 years. Further evidence of this policy is the fund of $5,000 per annum placed at the disposal of Prof. A. W. Thomas, of Columbia University, to conduct research freely and openly for the benefit of the leather industry as a whole. There are no strings to the fund and all of the results are published.

Investigations of vegetable-tanning processes are complicated at the very start by the fact that the chemistry of the two major materials, tannins and hide proteins, is still quite obscure. To make real progress requires research of the highest order. Each step in the process is beset by problems more or less baffling. Chrome tanning has also been studied, for, although the major product of this plant is Russia calf, a certain amount of chrome calf is made. In the following outline of manufacturing operations, an attempt has been made to indicate some of the more important problems that have been encountered. It will be obvious that anything even approaching a thorough discussion would require a good-sized volume.

Raw Skins Refrigerated

In order to obtain maximum strength it is essential that the calf skins should yield a finished leather thin enough to be used without splitting. Sources of supply throughout the world are drawn upon in meeting this requirement. Most of the skins have been treated with salt at the point of origin, although some skins are received fresh from near-by sources and salted at the plant. The salt acts as a preservative. As a further precaution against bacterial decomposition, the skin storage department is kept at a temperature of 10 deg. F. Incoming skins are reduced very gradually to this temperature to prevent possible damage due to sudden freezing. At this temperature the skins may be kept indefinitely without deterioration.

Before the work of preparing the skins for tanning can be started, it is necessary to get them back to a condition approaching as nearly as possible that of the fresh skin. As required, skins are sent from storage down chutes to washing drums, where salt and dirt are partly removed. Soaking overnight in vats carries the

cleaning process further. The following day flesh or adipose tissue is removed by working the skin on a fleshing machine. Further soaking for 2 days in paddle vats completes the process of bringing the skins back to normal condition through absorption of water and in addition has the desirable effect of removing water-soluble proteins.

As the skin proteins are almost ideal foods for many types of bacteria, careful control is necessary to avoid irreparable damage to the skin structure. Plenty of fresh, clean water and a temperature never above 50 deg. F. will effectively prevent trouble during soaking.

Hair Loosened by Lime

Attention is next directed to the removal of hair from the skin. Long ago it was found that soaking hides or skins in saturated lime water for several days would loosen the hair so that it would slip out easily. Not until very recently, however, has the mechanism of this action been understood.

Microscopic examination of sections of raw skin has demonstrated that the skin consists of three distinct

Fig. 1—Unhairing Machine

parts: A relatively thin outer layer of epithelial cells, the epidermis; a much thicker layer, which constitutes the derma or true skin; and a certain amount of adhering adipose tissue on the flesh side. The true skin, which is the only part desired for leather, is thus sandwiched between the epidermis and the adipose tissue. The latter, as has been noted, is removed on the fleshing machines.

Further study reveals the fact that the epidermis forms a continuous layer over the entire outer surface of the skin, dipping down to form a follicle for each hair and pockets for each group of sebaceous (fat) glands and sudoriferous (sweat) glands. The hair and these glands are thus part of the epidermal system.

So far as growth is concerned, the epidermis may be considered a parasite; it has no blood vessels of its own. Those epithelial cells in contact with the true skin grow and reproduce through nourishment absorbed from the blood and lymph of the latter. As the older cells are pushed out toward the surface they dry up

Fig. 2—Working on the Beam
One of the most characteristic operations of tanning

gradually, the outermost forming the comparatively tough material which we ordinarily consider as scarf skin.

It is fortunate for the tanner that the epidermis and the true skin differ chemically to such an extent that it is possible to choose agents that will attack the epidermis without injuring the true skin. It is not easy to dissolve the epidermis completely without affecting the derma, but the newly formed epithelial cells may be dissolved without difficulty in lime water. This loosens the older portion of the epidermis so that it can be removed, taking with it the hair and the glands. Present knowledge on these points makes possible intelligent control of this important operation.

From the soaking vats the skins go to another series of paddle vats, where they are treated with saturated lime water containing some sodium sulphide to hasten the reaction. With chemical control, the liming operation is complete in two days and the loosened hair and epidermal system are removed on unhairing machines. Although no longer in use, Fig. 1 shows a machine in which the principle of operation is more evident than it would be with the more modern types. Hair removal is accomplished by the action of the revolving, blunt, spiral blades pressing against the hair side of the skin as it is supported on a rubber slab or blanket.

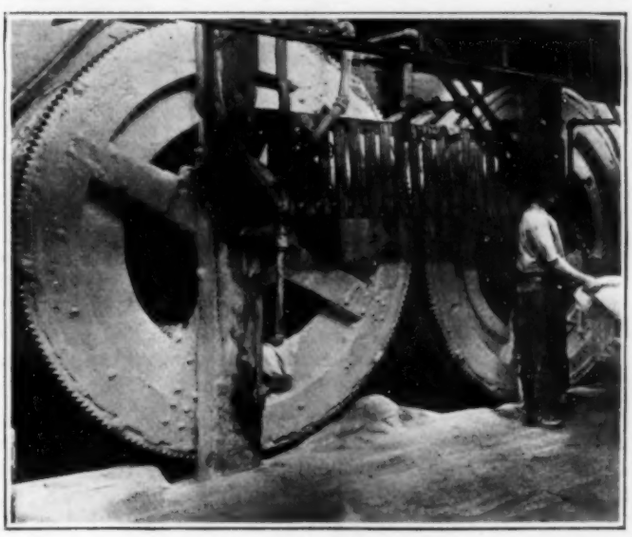


Fig. 3—Wash Drums

Many of the hair follicles and pores still contain bits of hair and glands, particles of lime soaps and dirt. These are removed by placing the hides on a curved support known as a beam and working with a two-handled knife, strokes being made in the direction of the hair, from root to tip, so as to squeeze out the dirt. At this stage the skins are translucent enough so that the beamster can see the dirt and thus determine when the skins are properly clean.

This operation, called scudding, is one of the most characteristic in the entire leather industry. It is well illustrated in Fig. 2. Before the development of unhairing machines, all of the hair was removed by hand on the beam. This is why that part of the tannery which prepares the skins for the actual tanning operation is still referred to as the beamhouse.

So far no machine has been developed that will satisfactorily scud calf skins, because the follicles slope in many different directions and require almost individual attention. The field is a promising one, for the work is most disagreeable and the beamsters must be highly skilled.

From the beams the skins go to the open washing drums shown in Fig. 3. Some of the lime is removed, but the skins still remain in the plumped condition—that is, the hide protein or collagen has become swollen through absorption of water in the alkaline lime liquor. The water absorbed is held so tenaciously that it is impossible to remove any by squeezing or wringing and the skins have a characteristic rubbery consistency. This phenomenon is common to proteins and is quite familiar in the case of gelatine. Either acid or alkaline conditions will produce swelling. Tan liquors are usually somewhat acid and long ago tanners learned by sad experience that trouble was almost certain to follow if the limed skins were placed directly in the tan liquors. This gave rise to a curious process known as bating. It is found that infusions of dung would reduce the skins to an unswollen or "fallen" state. They lose the rubbery feel, and the absorbed water can be squeezed out readily.

Fig. 4—Bate Master Examining Skins in Bating Paddle Vats

Studies on proteins, particularly gelatine, have shown that this swelling is a function of hydrogen-ion concentration. Careful investigations have demonstrated that both gelatine and calf skin exhibit two points of minimum swelling, gelatine at p_H values of 4.7 and 7.7, calf skin at 5.1 and 7.6. Consequently in order to bring a plumped skin to the fallen condition so that vegetable tan liquors will penetrate rapidly, it is necessary only to bring it to a p_H of about 8. This the dung bates did quite effectively, the phosphates naturally present acting as buffers to keep the p_H at about the neutral point. If it is desired simply to bring the skins to a fallen condition, sodium acid phosphate will do the work much more effectively than the old bates.

But the dung bates had other functions as well. The weak organic acids served to delime the skins, while the enzymes present acted upon certain of the proteins in the skins. Only recently has the mechanism of the enzyme action been established, principally through experiments conducted at this plant. Just under the grain surface of the skin is a layer of fibers that differ from collagen, the chief hide substance. These are known as elastin fibers and by skillful use of the microscope it was demonstrated that the enzyme pancreatin would digest elastin. This removal of elastin produces a somewhat softer leather and where this is desired pancreatin or some of the artificial bates now on the market can be used. To make certain of elastin removal without loss of collagen requires careful control.

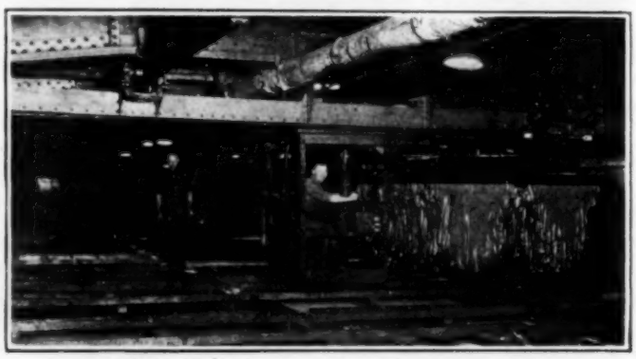


Fig. 5—Tanyard

Bating is conducted in paddle vats. Fig. 4 shows the bate master examining a skin. By experience it is possible to determine thus when a skin has "fallen" sufficiently, but not whether the elastin has been removed. The hydrogen-ion concentration of the bate liquors is rigidly controlled.

After bating, the skins are examined and it is decided whether they are to be vegetable tanned or chrome tanned.

Those skins that are to be vegetable tanned go to the tanyard, shown in Fig. 5. They are fastened to sticks placed in a wooden frame large enough to fit in one of the pits or vats. The skins are first placed in an exhausted liquor containing very little tannin and much soluble non-tannin. Each day they are moved to a stronger liquor until the tannin has completely penetrated the skin and all of the collagen has been converted into leather. Movement of the skins is facilitated by the electric traveling crane which enables the operator to pick up a whole pack of skins and move them about as desired. Because of the low headroom available, no little engineering skill was required in making the crane installation.

Many factors influence the rate of tanning. Among these are: time, concentration of tan liquor, hydrogen-

Fig. 6—Chrome Tanning Is Done in These Drums

ion concentration of liquor, presence of non-tannins and salts. By controlling these, it is possible to reduce substantially the tanning time without affecting the quality of the finished leather.

Basic chromium salts will also convert collagen or hide substance into the imputrescible material which we call leather. For light leather sold on the basis of area rather than weight, this method has been widely adopted. A minimum of about 45 parts of tannin is required to convert 100 parts of collagen into leather, whereas 3.4 parts of chromic oxide is sufficient to render 100 parts of collagen imputrescible. In both cases, these are minimum values; commercial leathers usually run higher, but they emphasize the weight-giving property of vegetable tanning which is the most characteristic distinction between the two methods. In chrome tanning, less material has to diffuse into and combine with the fibers, and consequently the process is much more rapid than vegetable tanning. It is also easier to control.

Prior to chrome tanning, the bated skins are brought into equilibrium with a solution containing sulphuric acid and salt. This treatment removes any remaining lime and also assures a uniform condition of the skins, which is of great help in controlling the tanning.

Pickled skins are tanned by tumbling with chrome liquor in wooden drums as shown in Fig. 6. The liquor is made by reducing sodium bichromate with sulphur dioxide until the basicity of the liquor corresponds to $CrOHSO_4$. Tanning is complete when test strips will stand boiling without curling or shriveling. When this point is reached, the skins are removed from the tan liquor and the sulphuric acid which they contain is neutralized to the desired extent. Complete neutralization is not feasible; it makes the leather brittle, although the reason for this is not clear. A typical finished chrome leather may contain about 6.5 grams of sulphuric acid per 100 grams of skin protein. This acid is, of course, combined either with the chromium compounds or with the protein, but there is always a trace of free acid resulting from hydrolysis, and if the free acid is removed in any way more is formed by hydrolysis to re-establish equilibrium.

Although chrome tanning is not as complicated as vegetable tanning, it is also affected by a number of factors, such as concentrations of chromium salt, neutral salt and hydrogen-ion, and successful operation requires control of these.

As a result of the processes that have been described the skins have been converted from a material subject

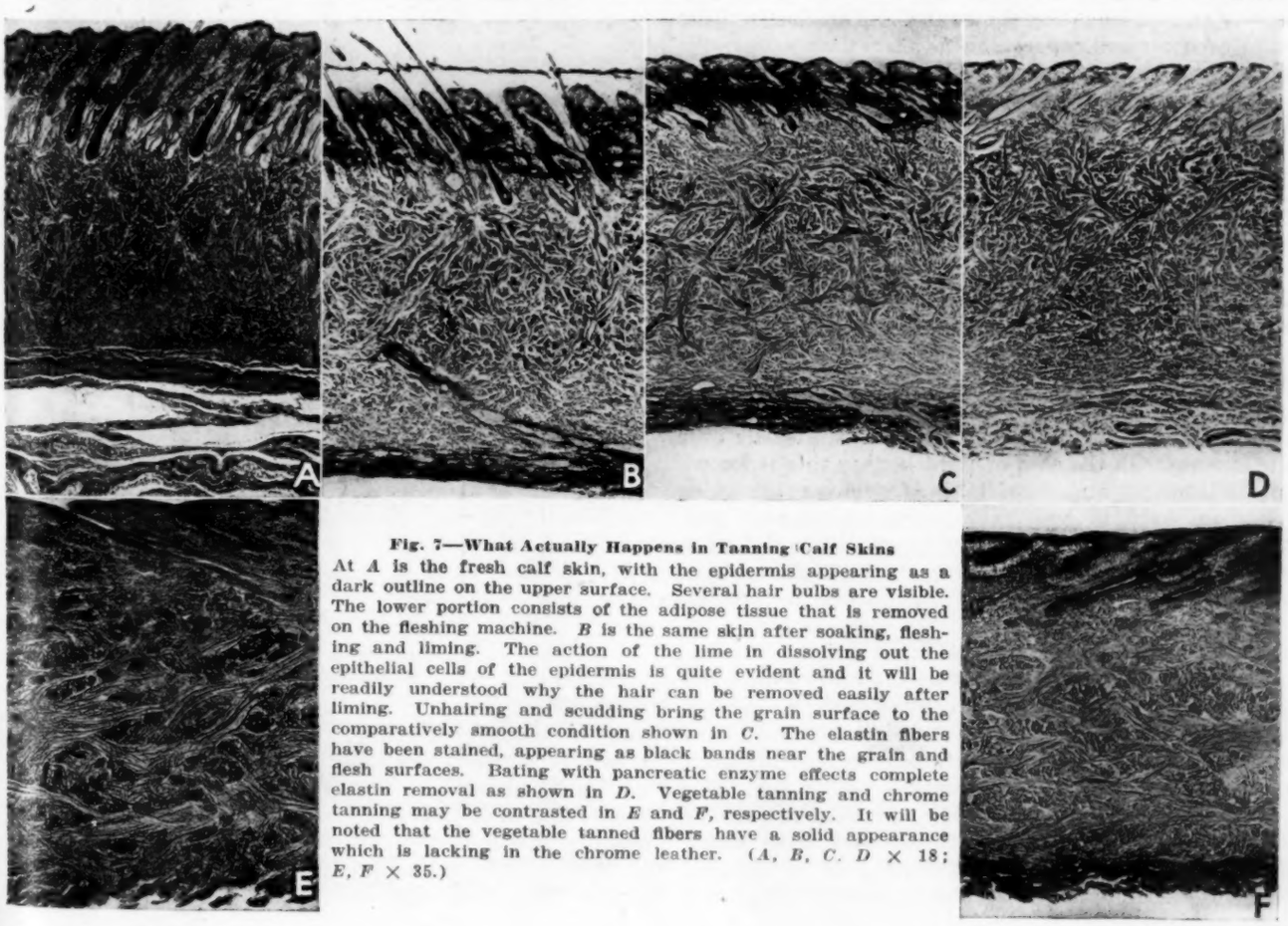


Fig. 7—What Actually Happens in Tanning Calf Skins

At *A* is the fresh calf skin, with the epidermis appearing as a dark outline on the upper surface. Several hair bulbs are visible. The lower portion consists of the adipose tissue that is removed on the fleshing machine. *B* is the same skin after soaking, fleshing and liming. The action of the lime in dissolving out the epithelial cells of the epidermis is quite evident and it will be readily understood why the hair can be removed easily after liming. Unhairing and scudding bring the grain surface to the comparatively smooth condition shown in *C*. The elastin fibers have been stained, appearing as black bands near the grain and flesh surfaces. Bating with pancreatic enzyme effects complete elastin removal as shown in *D*. Vegetable tanning and chrome tanning may be contrasted in *E* and *F*, respectively. It will be noted that the vegetable tanned fibers have a solid appearance which is lacking in the chrome leather. (*A*, *B*, *C*. *D* × 18; *E*, *F* × 35.)

to rapid deterioration into a stable product. Before proceeding with the finishing operations, it will be of interest to review briefly the mechanism of tanning by referring to the series of photomicrographs in Fig. 7. This remarkable group was prepared in the Gallun laboratories. It represents the results of years of study, and tells the story of leather better than a lengthy discussion.

In all of the figures the hair or grain side of the skin is at the top. *A* is the fresh calf skin, with the epidermis appearing as a dark outline on the upper surface. Several hair bulbs are visible. The lower portion consists of the adipose tissue that is removed on the fleshing machines. *B* is the same skin after soaking, fleshing and liming. The action of the lime in dissolving out the epithelial cells of the epidermis

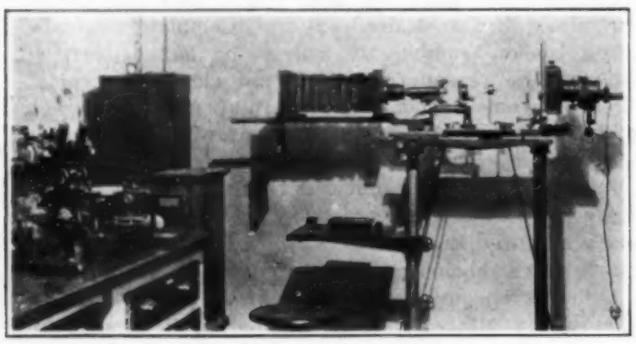


Fig. 8—Equipment for Making Investigations Such as Those Shown in Fig. 7.

is quite evident and it will be readily understood why the hair can be removed easily after liming. Unhairing and scudding bring the grain surface to the comparatively smooth condition shown in *C*. The elastin fibers have been stained, appearing as black bands near the grain and flesh surfaces. Bating with pancreatic enzyme effects complete elastin removal as shown in *D*. Vegetable tanning and chrome tanning may be contrasted in *E* and *F*, respectively. It will be noted that the vegetable-tanned fibers have a heavy, solid appearance that is lacking in the chrome leather.

Lubricating Leather Fibers

While the tanning has produced a stable product which is really leather, myriad finishing operations are required before it has all of the properties that we associate with finished leather. If leather is dried directly after tanning, it is usually stiff and will crack easily. By working in greases and oils it is possible to lubricate the fibers so that they will slip easily over one another. In the case of light leather this is known as fatliquoring and consists in drumming the skins for about half an hour in a warm emulsion of such materials as sulphonated neatsfoot oil, soaps and moellon degras. The oil globules of the emulsion are precipitated on the surface of the leather, but do not penetrate to any extent. The finer the emulsion the more uniform is the distribution of oil over the surface.

The leather is now dried, and as the water evaporates the oil diffuses into the skin, eventually giving the desired result of lubricating each individual fiber. The vegetable leather takes up 10 to 15 per cent oil while 4 to 8 per cent suffices for chrome.

Before fatliquoring and dyeing, the skins are shaved to give uniform thickness and wet back with water. Vegetable-tanned leather is drummed in a mordant solution of titanium potassium oxalate, washed and then drummed in a solution of basic dye of the required shade.

Chrome leather is dyed directly with acid dyes, or it may be given a light surface retanning with sumac before fatliquoring, dyed with basic dyes the same as vegetable tanned skins and subsequently fatliquored.

Many mechanical operations follow for the purpose of imparting certain physical properties or appearance to the leather. Special machines smooth out wrinkles, compact the leather and render it more pliable. The grain surface is then sized with a material such as sodium caseinate to make it water-repellent and to add luster. Measuring on an ingenious machine (Fig. 11), which indicates the number of square feet in a skin passed through, completes the operations prior to sorting and bundling for shipment.

From what has been already said, it is evident that the Gallun laboratory is not merely an ornament, stuck off somewhere in a corner and never allowed to have a say in production. On the contrary, the laboratory is the heart of the tannery, exercising complete control over all manufacturing operations.

The main laboratories occupy the entire fifth floor of the brick and concrete building shown at the left in the headpiece. They cover about 7,500 sq.ft. of floor space, divided into nine rooms. One is devoted to the analysis of materials used in the tannery, including inorganic chemicals, tanning materials, enzyme preparations, oils, dyestuffs, finishing materials and leather in various stages of manufacture.

The laboratory shown in Fig. 8 is equipped for mak-

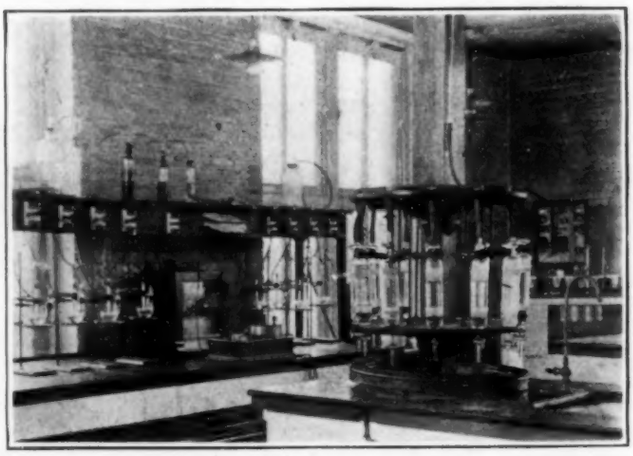


Fig. 9—Where Physical Chemistry Is Applied to Tannery Problems

ing exhaustive studies of the histology and chemical composition of skins used in making leather. As means for identifying any constituent part of the skin are developed, investigations are started to determine the effect of each kind of material used in the tannery upon this constituent. The results are being permanently recorded by means of photomicrographs.

Problems in physical and colloid chemistry are investigated in the laboratory shown in Fig. 9, where the latest advances in pure science are applied to problems in leather chemistry. To the left may be seen a battery of electrodes used chiefly for the determination and adjustment of hydrogen-ion concentration, one of the most important variable factors in tanning practice. In the right foreground is a circular battery of Wilson-Kern extractors, while a large Freas thermostat brings up the rear. The laboratory is well

equipped with apparatus needed in physical chemistry measurements.

Another laboratory is devoted entirely to bacteriological work. Here extensive studies are under way to determine the effect of various chemicals and modes of treatment upon the life and growth of the types of bacteria commonly found upon skins.

At appropriate places in the big plant there are small control laboratories devoted to the regulation of p_H value, temperature, and concentration of the active principles of the various tannery liquors.

Fig. 10 shows an experimental tannery, which is part of the laboratory equipment. Ideas originating in the

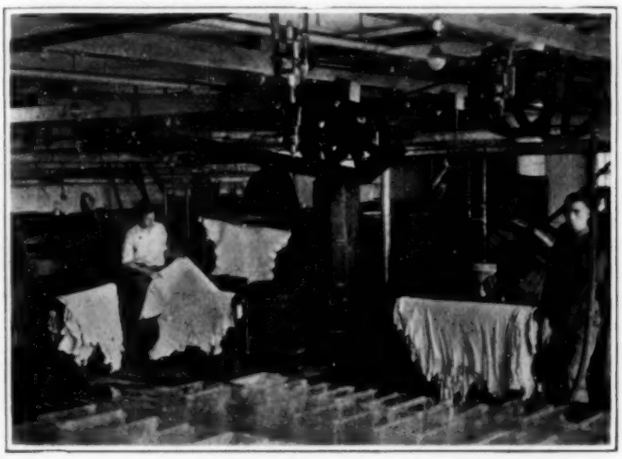


Fig. 10—Experimental Tannery

investigational laboratories are here subjected to practical tests, with small number of skins, under most rigidly controlled conditions for the purpose of insuring their satisfactory operation when carried out on a large scale in the big plant. Many apparently good ideas are buried here and as many better ones born. While this miniature tannery is capable of treating several hundred skins per day, it is so designed that all of the operations involved in making leather may be performed satisfactorily on a single skin.

An Important Study in Foot Comfort

Many of the investigations undertaken in these laboratories have a far-reaching importance, extending beyond this individual plant out into the industry as a whole and in some cases even to the public at large.

To the great shoe-wearing public the question of foot comfort is always a matter of vital importance. One of the factors most disturbing to foot comfort is the change in area of leather with variation in relative humidity. A shoe that fits rather loosely on a damp day may pinch the foot most annoyingly when the atmosphere becomes dry. It has been discovered that the degree of shrinkage and expansion of leather with changing humidity is determined by the composition of the leather and may be small for one kind of leather and relatively very large for another.

The change is really one of volume and increases with both the percentage of protein in the leather and the amount of acid in combination with the protein. Among the common shoe upper leathers, the greatest contrast in this respect is to be found between chrome and vegetable tannages. The fact that the Gallun tannery specializes in both kinds of leather has made reliable measurements of difference possible. Comparing the best types of each, it is found that the finished chrome leather contains nearly twice as much protein and about 6 parts of sulphuric acid combined with each 100 of protein, against practically none in the vegetable leather. Chrome leather seems to require this acid, becoming brittle when it is removed.

This results, as would be expected, in very much larger area changes in chrome than in vegetable leathers. In going from completely dry to saturated air, the vegetable leather increased in area only 6 per cent, against more than 18 per cent for the chrome leathers. Differences due to the skins themselves are eliminated by cutting them along the line of the backbone and tanning one half of each in chrome and the other in vegetable tan liquors.

It is, of course, known to many that chrome leather shoes are not nearly so comfortable as those of vegetable leather made from the same type of skin. There was a tendency to attribute this difference to the small amount of free sulphuric acid always present in chrome leather in equilibrium with the comparatively very large amount in combination with the protein. But these recent investigations indicate that it is rather due to the much greater degree of shrinkage and expansion of the chrome leather with changing degree of relative humidity.

It is rather regrettable that chrome leather should show up so much less favorably than vegetable leather, because chrome leather can be made much more quickly, simply and cheaply than vegetable leather. It is for this reason that tanners have urged the more widespread use of chrome leather, especially since both

Fig. 11—Measuring Finished Leather

kinds of leather sell at about the same price. It has also been questioned as to whether the supply of natural tanning materials would hold out long, if everyone should demand shoes that were made from vegetable-tanned leather.

Acknowledgment

The writer wishes to acknowledge his indebtedness to the A. F. Gallun & Sons Co. for permission to publish the foregoing discussion, and to John Arthur Wilson, chief chemist, for assistance in the collection of data. Mr. Wilson has embodied the results of much of the work done at the Gallun laboratories in his book "The Chemistry of Leather Manufacture," to which the reader is referred for more detailed discussion of any of the points considered in this article.

Cane Sugar in Cuba

A Continuation of the Article on the Technology of Producing Raw Sugar From Cane, Including Evaporation, Boiling and Graining

By Albert M. Young
Formerly Chemist, Central Control Laboratory, Cuban-American Sugar Co., Cardenas, Cuba

THE earlier part of this article (*Chem. & Met.*, June 2, 1924) set forth the natural and economic advantages under which the island of Cuba produces one-fifth of the world's supply of sugar. Once the cane is harvested and brought to the factory, or "central" as it is called, a manufacturing process replete with chemical engineering is begun. The crushing of the cane, the extraction of the sugar and the purification of the cane juice are described in detail in the first article. The thread of the narrative is picked up here with a consideration of the new equipment for clarifying the juice.

The Dorr clarifier, an adaptation of a machine used in more than a hundred different industries for thickening suspensions of solids in liquids, is illustrated in Fig. 1. It consists of an upright cylindrical tank, about 20 ft. in diameter, provided with three to five horizontal trays on which the precipitate settles. The limed juice, heated to about 212 deg. F., enters at the top through the central well. The scum rises rapidly and is scraped off the surface at the scum-box. The sludge settles on the trays and is directed by slowly revolving scraping arms to the central well, where it gravitates to the bottom of the tank, to be removed by a diaphragm pump. The clear juice is drawn off continuously from above each tray. The rate of withdrawal of the clear juice is controlled by raising or lowering the level of the outlet pipes, so that whenever the juice from a single tray begins to run turbid, its outlet pipe can be raised somewhat to decrease the rate of flow.

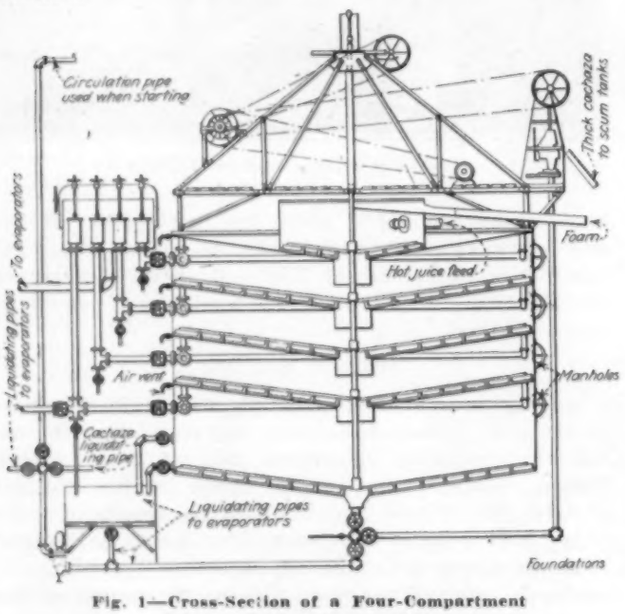


Fig. 1—Cross-Section of a Four-Compartment Dorr Clarifier in Operation

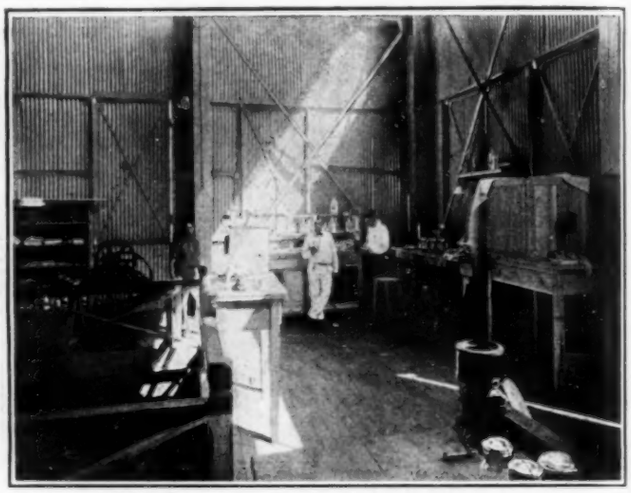


Fig. 2—The Laboratory at the Central Macareño
The polariscope is inclosed in the box at the right.

There are many advantages in continuous clarification. There is a continuous flow of clean, bright juice. As the apparatus can be very perfectly insulated, there is much less heat loss than with the open type of defecator. The juice enters the Dorr clarifier at about 212 deg. F. and passes out to the evaporator supply tank at about 205 deg. F. There is a saving of fuel also because of the fact that no further heating in the Dorr clarifier is required. The cleaner sugars obtained are easier to refine and they keep better. There is a considerable saving of labor and of floor space, and finally only 5 per cent of the juice is carried to the presses, as against 10 per cent with the old type of defecator. Hence there is a reduction of sugar loss in the press-cake.

Because of its many advantages, it is probable that the Dorr clarifier will gradually displace the open type of defecator.

The Petree Process

In the Petree process—often applied in conjunction with the Dorr clarifier—the unfiltered settlings from the Dorr, or from the defecators, are returned to the mills. The solid part of the sludge becomes suspended on the bagasse and eventually is burned, while the sugar in solution is incorporated with the juice and goes on through the factory.

A working scheme for the Petree process is shown in the diagram, Fig. 3.

The first mill juice, containing the bulk of the sugar, goes to Dorr No. 1 and the clear juice from this clarifier goes directly to the evaporator. The mud is combined with the second mill juice and reclarified

in Dorr No. 2. The secondary mud from this clarifier, combined with the third mill juice, is put back upon the bagasse behind the first mill. Thus there is no chance of contaminating the rich first mill juice.

The feasibility of the Petree process depends to a large extent upon the physical state of the sludge. It is said that the sludge from the Dorr clarifier is especially well suited to the Petree process.

The great advantage of the Petree process lies in the elimination of the filter-press station. This means a saving of labor, floor space, filter cloths, etc., as well as the elimination of a reeking sweatshop that is an eyesore to the sugar house.

Concentration of Juice

Removal of water from the juice to the point where crystalline sugar is formed takes place in two stages: (1) The concentration of the juice to a sirup containing 50 to 60 per cent solids, (2) the subsequent "graining" of this sirup.

The clarified juice with the filtrate and washings if any from the presses goes first to the multiple effect evaporator. In practice evaporators of three, four, five or six bodies are encountered. They are entirely similar in principle and operation to the multiple effect evaporators used in other industries. The evaporator shown in Fig. 4 is a quintuple effect.

Sugar Boiling

As the process of sugar boiling or "graining" is unique, it will be described in some detail.

On account of the delicacy of the process of sugar

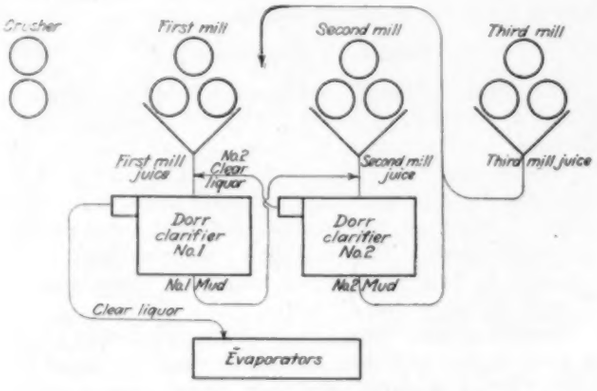


Fig. 3—Petree-Dorr System of Operation

boiling it is necessary or at least expedient to carry out the second stage of the evaporation in a single effect. It would be no exaggeration to say that the sugar boilers are the most important men in the factory. Their art requires unusual skill for its perfection, besides years of experience. Moreover, these men carry a great deal of responsibility, for a poor sugar boiler might unwittingly cause the loss of hundreds of dollars daily.

Successful sugar boiling is an example of the extraordinary human sensitiveness to small differences in feeling, texture or appearance that is found in many industries. The practical man often excels the scientist in ability to judge the condition of materials in process. The sugar boiler is guided largely by the "feel" of the sirup being evaporated and by the appearance of the magma when crystals begin to be formed. By virtue of long experience he is able to judge the point at which a sufficient number of crystals has been formed to fill the pan when they are grown.

As stated above, the juice has been evaporated in the multiple effect to a sirup of 50 to 60 per cent solids. The sugar boiler draws into his vacuum pan a "drink" of sirup. This he concentrates until a small sample withdrawn by the "proof-stick" (a sampling rod arranged to move in and out through the shell of the pan without releasing the vacuum) shows the formation of a sufficient number of minute sugar crystals ("sparks"). The purpose of the sugar boiler is now to build up these tiny grains until they attain the desired size.

By means of successive "drinks" followed by periods of concentration he is able to build up the original seed crystals without ever bringing about such conditions

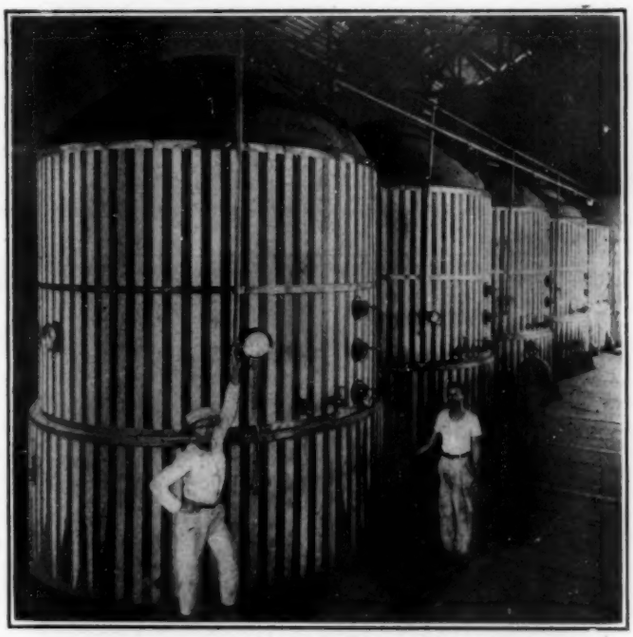


Fig. 4—Quintuple Effect Evaporator for Cane Juice

of supersaturation that the formation of new or "false" grain occurs. The result of this procedure is that the final product is composed of crystals that are roughly of the same size, and each of which is separate and distinct from its fellows.

In the manufacture of raw sugar it is desirable to get the crystals as large as possible in the time available, because thus they offer less surface per unit of weight and so retain less molasses. If the sugar boiling is poor, many difficulties arise such as the clogging of the centrifugals, by false grain.

Vacuum pans used are of two general types: the coil pan and the calandria pan. The standard coil pan, of about 2,500 cu.ft. capacity, is ordinarily heated by live steam, and it is customary that the number of square feet of heating surface shall be approximately equal to the rated capacity of the pan in cubic feet.

Calandria pans are often installed in order to make use of the large amount of low-pressure or exhaust steam which in the sugar house results from the operation of numerous small pumps and engines. This type of pan is provided with about 1.5 sq.ft. of heating surface per cubic foot of pan capacity.

Under sugar factory conditions the performance of a single effect evaporator (2,500 sq.ft. of heating sur-

face) will be somewhat as follows: Steam is supplied to the calandria at 5 lb. pressure, corresponding to a temperature of 227 deg. F. If a vacuum of 27 in. is maintained in the pan, the juice will boil at 115 deg. F. The rate of evaporation will then be about 50,000 lb. of water per hour.

Separation of the Crystals

After the completion of the "strike"—that is, when the pan is nearly full of crystals of the desired size and regularity—the magma (called massecuite) is dropped into a crystallizing tank above the centrifugals. Slowly revolving arms inside the tank keep the massecuite stirred and thus promote further crystallization by bringing the crystals into contact with fresh molasses. This stirring is maintained for several hours before the strike is passed through the centrifugals.

The massecuite, almost black in color, is fed into the centrifugals by opening a spout from the crystallizing tank. As molasses is thrown off, the color brightens perceptibly. Spinning is continued for a minute or two and then the centrifugal is stopped by means of a brake. A flat ring in the bottom of the centrifugal is now removed. The sugar, still adhering to the sides of the basket, is loosened and discharged through the

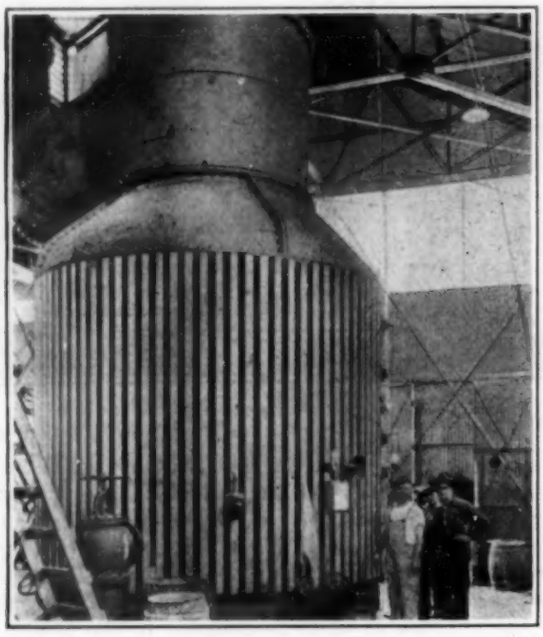


Fig. 5—The Art of Sugar Boiling
Carried out in a single effect evaporator of this type.

opening by lowering a mechanical arm that scrapes the mesh while the basket is slowly revolved.

About 5 minutes is required for the cycle of charging, accelerating, running at speed, braking and discharging. Centrifugals, commonly run at about 1,000 r.p.m., require 4 hp. while running at speed, but considerably more than this for starting. If belt drive from a steam engine is used, it is customary to allow 12.5 hp. for each centrifugal. If individual motor drive is to be installed, practice calls for a 20-hp. motor for each centrifugal.

The action of the centrifugal is so effective in removing the molasses that raw sugars usually retain less than 1 per cent moisture. Some run as low as 0.5 per cent. Since the very thin film of molasses remaining around the grain tends to preserve it from the action of micro-organisms, there is little or no washing of raw sugar during the process of centrifuging.

High-grade "raw," "crude" or "centrifugal" sugars analyze about as follows: Sucrose, 95 to 97 per cent; glucose, 0.5 to 1.0 per cent; moisture, 0.5 to 1.0 per cent; ash, 0.5 to 1.0 per cent; dirt, trash, etc., re-

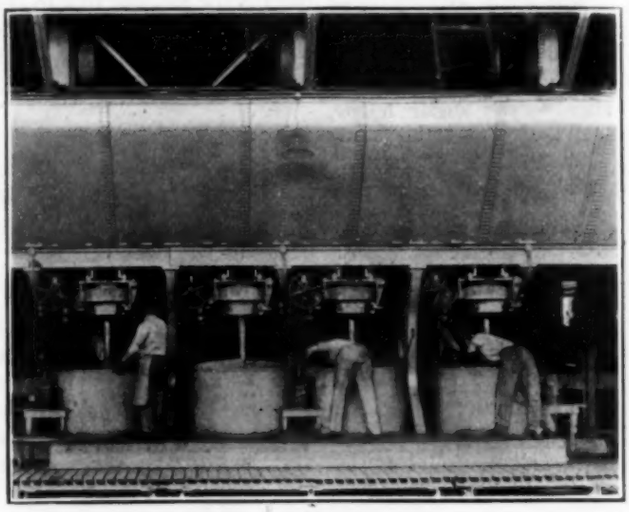


Fig. 6—Centrifugal Sugar
At the Central Macareño suspended type centrifugals are used with belt drive from a steam engine. They operate at 1,000 r.p.m.

mainder. Open kettle sugars of the old type, ranging from 80 to 90 per cent sucrose, have practically disappeared from the world's markets.

Reboiling the Molasses

The "first molasses" is always treated to exhaust it as far as possible of sugar. At least a dozen different systems are in vogue in Cuba at the present time. In one system the molasses is slightly diluted to dissolve the "grain" and then reboiled until it is on the point of graining, yet not so far that crystallization has taken place. This is called "boiling blank." The molasses is now run into crystallizing tanks and kept in slow agitation for 72 hours.

"Second sugars" thus obtained are practically as good as first sugars and they are usually sold on equal footing. "Third sugars" obviously arise from a similar treatment of "second molasses." Third sugars are not sold directly, but are put back into the evaporated juice or used as seed crystals in graining.

"Final molasses" is that from which no more sugar can be extracted by such methods. The loss here is about 15 to 25 per cent of original sugar. In Cuba no attempt is made to de-sugar the final molasses by chemical means, such as the formation of insoluble saccharates of calcium, strontium or barium. The Steffen process, in which the sugar is precipitated from the molasses as calcium saccharate, is used to a large extent by the Great Western Sugar Co. on beet molasses. Barium is used at one beet factory in Canada, and strontium somewhat in Germany. In general it may be said that chemical methods of extraction have been successful only in the beet sugar industry.

An attempt to apply the Steffen process, for example, to the cane sugar industry would encounter two principal difficulties: first, the precipitation of calcium saccharate takes place only in the cold (10 to 15 deg. C.),

and hence in warm climates extensive refrigeration would be required. In the second place, invert sugar (practically absent from beet molasses) would in the treatment of cane molasses be precipitated together with sucrose. Hence, after removal of lime, the sucrose would still be contaminated with a large percentage of invert sugar.

Packing the Sugar

The crude sugar from the centrifugals is led by a conveyor to a storage box. Thence it gravitates into an automatic scale that weighs out the standard 325-lb. unit and delivers it into a sack held in position by a workman. The neck of the sack is sewed together by hand and the sugar is ready for shipping to the nearest seaport.

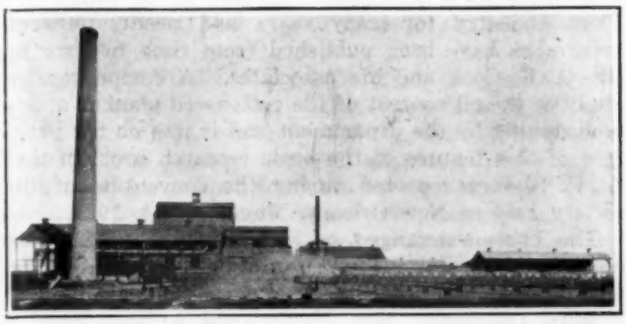


Fig. 7—Looking Across the Spray Pond at the Central

Chemical Control

The chemical control of the sugar house is undertaken for two purposes: first, as an aid to the superintendent in his handling of the diverse intermediate products of the factory; and second, to furnish data for a system of accounting whereby the officials over the superintendent may have a record of the yields, losses and performance of the sugar house.

The sugar laboratory is usually in charge of the "chief chemist," who is provided with two assistants called "benchmen." The duty of the benchmen is to carry out the routine of the laboratory. This work is somewhat analogous to production work, for if the tests are to be useful to the superintendent, they must be promptly executed and reported.

The function of the chief chemist is to correlate and interpret the results obtained by his assistants, and to make out the technical reports of the factory. These reports, issued daily and summarized periodically, give detailed statistics regarding the output of sugar and of molasses, the fuel consumption, and in general regarding the manufacturing efficiency.

Definition of Terms Used in Control Work

Polarization is obtained by the polariscope and the word is used to mean the percentage of sugar in a given product.

Brix is a measure of density. It is obtained by the use of a hydrometer so graduated that when immersed in a solution of pure sucrose, the Brix reading represents directly the percentage of sucrose. In solutions containing other solutes, the Brix is regarded as a measure of the percentage of total solids. Except in the case of very low-grade products this relation is sufficiently accurate for practical purposes.

Purity is defined as the ratio of sucrose to total solids, or for rough work it is represented by the ratio *Polarization* ÷ *Brix*. Evidently the purity of a solution represents the percentage of sugar on the basis of dry substance. For control work the determination of purity is very important, because it can be quickly made, and it furnishes a means of comparing the value of juices whose degree of dilution is constantly changing.

The following are the most important of the tests made:

1. *Juice*—Weight, Brix, polarization, invert sugars. Every 6 hours.

$$Polarization \times wt.\ juice = wt.\ sugar\ in\ juice$$

$$Polarization \div Brix = purity\ of\ juice$$

The purity of a juice or massecuite is an important figure, because it serves as a measure of the amount of sugar that can eventually be obtained by crystallization. As stated above, purity is roughly the ratio of sugar (sucrose) to total solids. As invert sugar, inorganic salts, organic non-sugars, etc., interfere with the crystallization of sucrose from solution, it is evident that the maximum yield will be obtained from a juice that is rich in sucrose as compared with extraneous solids. That is, a juice of high purity will give a large yield of sugar. Any increase in the percentage of invert sugar (based on total solids) during manufacture indicates inversion of sucrose. The trouble in this case is probably due to faulty clarification.

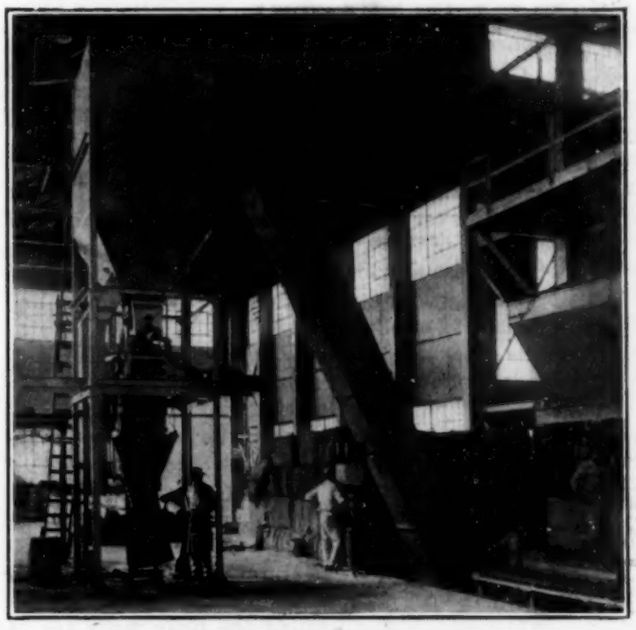


Fig. 8—A Sugar Packing Machine
From the centrifugal station at the right the sugar is conveyed and elevated to the hopper of the sugar packing machine.

2. *Sirup*—Brix, polarization. Every 3 hours. These determinations again are used to calculate the purity. The Brix is a measure of the total solids and hence it indicates the amount of water to be evaporated. The rate of evaporation and graining will be influenced by the purity of the sirup.

3. *Bagasse*—Moisture, sucrose. Every hour. The amount of moisture is an indication of the mill work and the fuel value of the bagasse. The percentage of sucrose measures the amount of sugar lost in the furnaces.

4. *Massecuites and Molasses in Process*—Brix, polarization, purity. Every strike. Purity here again measures the progress being made in the extraction of sugar.

5. *Final Molasses*—Brix, polarization, purity, invert sugar, ash. Each container. A completely exhausted molasses should have a purity of 30 to 35. Hence the determination of purity gives a final check on manufacturing efficiency, and it is one of the most important figures on the technical report.

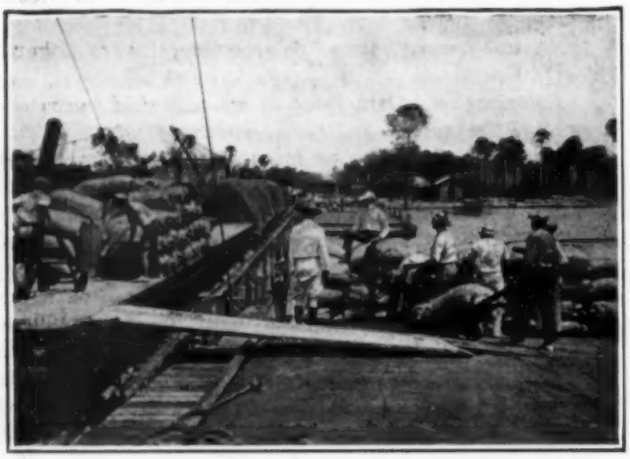


Fig. 9—Loading Raw Sugar at the Central Macareño
Sometimes loading directly into steamers is possible, but more often it is loaded upon flat cars as shown and shipped from the nearest port.

6. *Sugar*—Polarization, moisture, ash, invert sugar. Every 200 bags. Polarization of the raw sugar is very important, because it is a measure of quality and of the yield of sugar obtained. Polarization is used as a basis for the assessment of duty. Moisture, ash and invert sugar give an indication of the keeping and refining qualities of a sugar.

7. *Press Cake*—Polarization every 6 hours to determine the loss of sugar at this point.

8. *Condensed Water*—Polarization in 24-hour composite sample. Any appreciable polarization would indicate leaks in the evaporator coils or entrainment of sugar during evaporation. These are usually negligible.

9. *Fuel*—Measurement of the amount of wood or fuel-oil consumed.

Chemical control is essential to the efficient operation of the sugar house. To be of value it must be carefully performed. Unfortunately the tests made are of such a routine nature that the work becomes extremely tedious. Sugar men are agreed, however, that the best way to get an insight into the process of sugar manufacture is to do this work for two or more crops. It would be fair to estimate that 90 per cent of the operating men in Cuban sugar houses have been through a training period of this kind.

ACKNOWLEDGMENT

The photographs taken at Central Macareño illustrating various phases of sugar manufacture were made available through the kindness of W. F. Herbert, of Cambridge, Mass.; B. P. Luce, of Havana, and R. S. Carpenter, general manager of the Caribbean Sugar Co. The photographs are published through the direct permission of Mr. Carpenter. Mr. Herbert has aided also by suggestions and by supplying various details of the manufacturing process.

Variable Content of Oil and Ammonia in Cotton Seed From Various Districts

One of the projects suggested by the committee on basic research in oils and fats at the Washington meeting in October, 1921, of the American Oil Chemists Society was: "To develop varieties of cotton that will yield fiber of maximum value and seed containing the maximum percentage of oil; and also to determine the effects of cultural conditions." The problem of developing varieties of cotton suitable to the several sections of the cotton area has been a major project of the office of crop acclimatization of the U. S. Bureau of Plant Industry for many years and results on such researches have been published from time to time by Dr. O. F. Cook and his associates. A comprehensive study of the oil content of the cottonseed plant is a new undertaking by the department and it was on the progress of this feature of the basic research problem that A. F. Sievers reported during the convention of the society held in New Orleans, May 5 and 6, 1924.

The bureau arranged to include samples of cotton seed from a total of twenty-nine varieties grown at ten different stations as follows: one each in Virginia, Kansas, Oklahoma, New Mexico and Arizona, two in Texas and three in California. A number of interesting facts are revealed by a study of these three groups. It was noted that the average percentage of oil in the delinted seed of the high varieties was 24.31, and that for the low varieties was 22.43, the difference being 1.88 per cent. Among all the varieties and at all the stations the highest oil content noted was 31.74 per cent, the lowest 15.29 per cent. The variety giving this high yield at one station yielded only 16.01 per cent at another station, this being a difference of almost 100 per cent. On the other hand, the variety giving the lowest yield of the entire list gave at one station a yield of 28.68 per cent.

Relationship of Ammonia Content to Oil Content Important

The relationship of the ammonia content of the seed to its oil content is of much importance, since it is these two constituents that largely measure the commercial value of the seed. A study of these percentages showed that the ammonia averages of the varieties in the high oil groups and the low oil group are almost exactly the same—namely, 4.40 and 4.41 per cent respectively, based on the whole seed.

It appears, however, that there is a fairly definite relationship between the oil and ammonia content of the delinted seed when compared with reference to the points of production. Thus at one station the seed produced was exceedingly rich in oil (27.82 per cent), but in ammonia it was far below that from the other stations (4.14). On the other hand, at two other stations the seed had a low oil content (19.96 per cent and 20.02 per cent), but a high ammonia content (5.55 per cent and 5.69 per cent).

Confusion of Titanite With Ilmenite

On page 831 of this volume of *Chem. & Met.*, May 26, 1924, in an article on "Industrial Uses of Titanium," it was incorrectly stated that the formula of ilmenite was $CaTiSiO_5$. Opportunity is taken here of drawing attention to the correct formula for this ore, $FeTiO_3$. The formula given was that of the ore titanite.

The Direct Production of Iron

The Second of Two Articles Comprising a Critical Review of the More Important Methods That Have Been Used to Produce Wrought Iron From the Ore

By Edvin Fornander
Chief Metallurgist, Sandvikens Jernverk, Sandviken, Sweden

VON EHRENWERTH in 1891 proposed several arrangements for direct manufacture of iron. (See *Stahl und Eisen*, 1891, p. 978.) Fig. 1 shows one of these plans, based on the principle of reducing with gas only. The reduction was to be carried out in a shaft furnace, which was to be charged with ore only. The gas for reduction (producer gas) entered either through the openings *g* in the walls of the shaft or through the pipe *R* in the center of the shaft. When the reducing power of the gas was exhausted, the combustible portion remaining was burned by means of air blown in through the openings *l*. The finished sponge was either raked out (by way of a suitable cooling chamber) into the open, or else the furnace was built

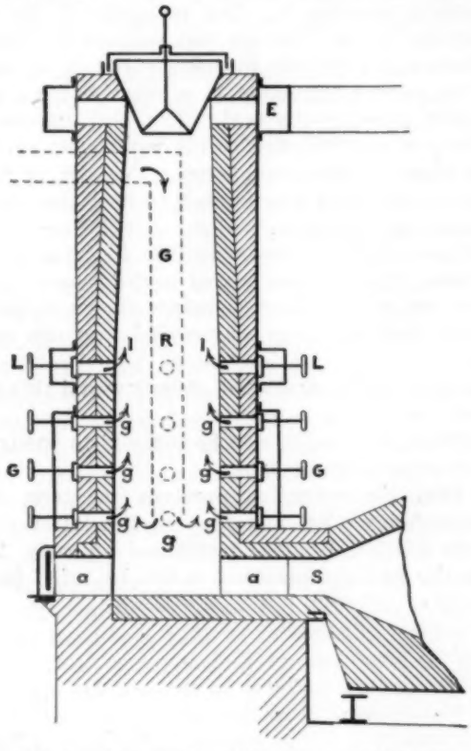


Fig. 1—Furnace Proposed by von Ehrenwerth

in direct connection with a melting furnace into which the sponge could be passed direct through a separate channel.

It is thus seen that the proposal belongs to the same group as the Chenot and Gurlt gas reduction methods, of which it is a development and improvement in that the carbon monoxide and hydrogen remaining from the reduction were wholly or partly burned in the upper part of the shaft, by which means the ore was heated to the proper reduction temperature.

When carbon monoxide is passed over iron ore at a temperature below about 700 deg., it readily forms carbon dioxide and separates finely divided carbon. This carbon mostly settles in the cracks in the ore. The pieces of ore then expand and burst, so that the ore increases in volume. If such a product is put into the furnace, it is likely to cause delays and losses. Chenot and Gurlt must certainly have experienced this trouble at least occasionally; von Ehrenwerth overcame the difficulty by heating the charge before it reached the reduction region.

It is not known to the writer whether the von Ehrenwerth process has been tried to any extent.

If a calculation is made to see how much the coal consumption would be for this process, it will be seen that the figure is quite high. Suppose, for example, that Fe_2O_3 is to be reduced. Assume further that the reduction proceeds in two stages: The gas coming from the producer, which may be assumed to consist solely of CO and N_2, reduces any FeO in the lower part of the shaft to Fe. Assume in the resulting gas mixture the ratio $CO_2 : CO = 25 : 75$. This gas in its turn reduces Fe_2O_3 to FeO, so that the gas rising from the reduction space has the ratio $CO_2 : CO = 37 : 63$. Hence the equation for the reaction is:

$$Fe_2O_3 + 8C + 4(O_2 + 3.7N_2) = 2Fe + 3CO_2 + 5CO + 14.8N_2$$

In this theoretical case the coal consumption would be 860 kg. of carbon per ton of Fe. The heat of combustion of the CO present after reduction is several times that required to heat the charge up to the proper reduction temperature.

It thus appears that the reduction of iron ore with producer gas alone according to the method just described takes too much fuel and from the economic standpoint is not a feasible method. The only exception to this general rule would be a special case where the combustible gas left after the reduction and heating could be put to some other use.

Meanwhile a proposal has been made in recent years for a new method based on exclusive gas reduction, in which the fuel consumption is calculated to be very low compared with the older methods of the gas reduction group. This is brought about by excluding atmospheric oxygen from the process. The gas coming from the reduction region is withdrawn and passed over a strongly heated layer of coal. By this means the carbon dioxide in the gas is again reduced to carbon monoxide, after which the gas with its renewed reducing power is again passed into the reduction space. The gas formed in the new reduction is withdrawn from the circulation system and wholly or partly burned, the heat thus obtained being used to heat the ore to the optimum reduction temperature. The reaction is strongly

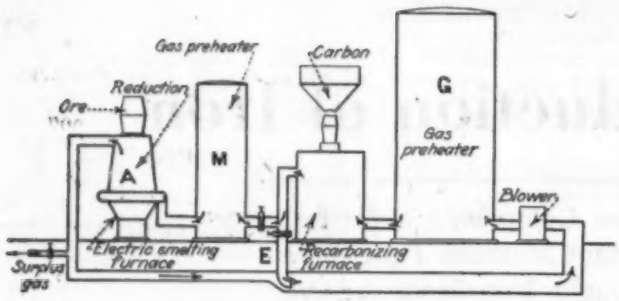


Fig. 2—First Bourcoud Process

endothermic ($CO_2 + C = 2CO - 39.4$ Cal. per gram mol.), and so heat must be supplied from some outside source in order to keep the reaction going. Several processes, depending on the basic principle just described, have been proposed.

The Bourcoud Methods

The Spanish Bourcoud process belongs to this group. Fig. 2 gives a schematic view of the arrangement. The ore was reduced by circulating gas in the shaft *A;* the lower part of the shaft was ingeniously arranged as an electric furnace to melt the sponge. The CO_2-bearing gas was drawn from the top of the reduction shaft by means of a gas pump and passed into a heater, where it was heated to a calculated temperature of 1,200 deg. From here it passed into a shaft filled with glowing charcoal (the recarbonizing furnace), where the CO_2 was converted to CO. The temperature of the gas being greatly decreased by this endothermic reaction, it was then passed into another heater *M,* where it was again raised to 1,200 deg. before being returned to the reduction furnace. But the reaction in the recarbonizing furnace took more heat than could be supplied by this means alone. To gain the extra supply of heat, a portion of the gas was passed through the pipe *E* direct from the recarbonizing furnace to the preheater *G,* without going through the reduction shaft. The required amount of heat was obtained from this extra current of circulating gas. The gas formed by the reduction (mixed with producer gas from a separate fuel supply) was used to heat the heaters. According to Bourcoud's calculations, each metric ton of iron melted should require 295 kg. of charcoal for reduction, 310 kg. of lignite for producer gas and 650 kw. of electric energy.

It may be seen that Bourcoud's first proposal contains several novel features of importance—namely, the exclusion of atmospheric oxygen and the introduction of gas circulation and the recarbonizing furnace. The process has the disadvantage, however, of being very complicated and is not likely to attain any practical importance; but it does furnish a new link in the chain of development.

More recently Bourcoud proposed a newer method (see *Iron Trade Review,* 1921, Aug. 11) based on the following principle: The reduction is carried out with gas made from powdered charcoal and preheated primary air in a specially constructed producer. The reduction takes place in a rotary furnace provided with an inside coil designed to effect an intimate mixture of gas and ore; the latter is preheated in a separate rotary furnace before being charged into the reduction furnace. A part of the gas coming from the reduction furnace is used to heat the preheating furnace and the heater for the primary air for the producer; the rest of the gas is calculated to be sufficient to generate electric energy for melting and refining the spongy iron in electric furnaces. The inventor calculates the coal consumption to be 1.15 to 1.45 tons per ton of refined steel. The arrangement is shown in Fig. 3.

It may be seen that Bourcoud's last proposal was based on the same principles as von Ehrenwerth's, but Bourcoud used a different arrangement and conceived the idea of using the excess gas for heating the producer gas and for melting the sponge. So far as is known, the last Bourcoud method has not yet been tried out on a practical scale; and it is certain that the necessary automatic mechanical devices, which would have to function at high temperatures, would offer difficulties.

The Berglöf Process

The process of the Berglöf brothers (Algot and Elof Berglöf) may be said to be an outgrowth of the first Bourcoud method. The first experiments with the method were made by A. Berglöf about 1914 at Storfors, Sweden, and after his death his brother Elof did further work on it. The principle of the process is shown in Fig. 4. The ore was reduced by circulating gas; the carbon dioxide formed by reduction was converted to carbon monoxide in a recarbonizing furnace filled with glowing charcoal. The heat necessary for this reaction was supplied to the recarbonizing furnace in the form of electric energy. A part of the gas formed by reduction was burned to heat the ore before it reached the reduction region. Berglöf conceived the idea of carrying out the reduction in interchangeable containers. The ore was heated to the proper reduction temperature in the upper container shown in the drawing; then this container was moved into the reducing zone.

How much fuel and electric energy would this process require? Assume:

(1) That pure Fe_2O_3 is to be reduced to spongy iron, the fuel being pure carbon.

(2) That the reduction proceeds in steps, first to FeO and then to Fe, and that in the latter step the favorable CO_2 : CO ratio is attained—namely, 25 : 75.

Then the fuel consumption is 234 kg. of C per 1,000

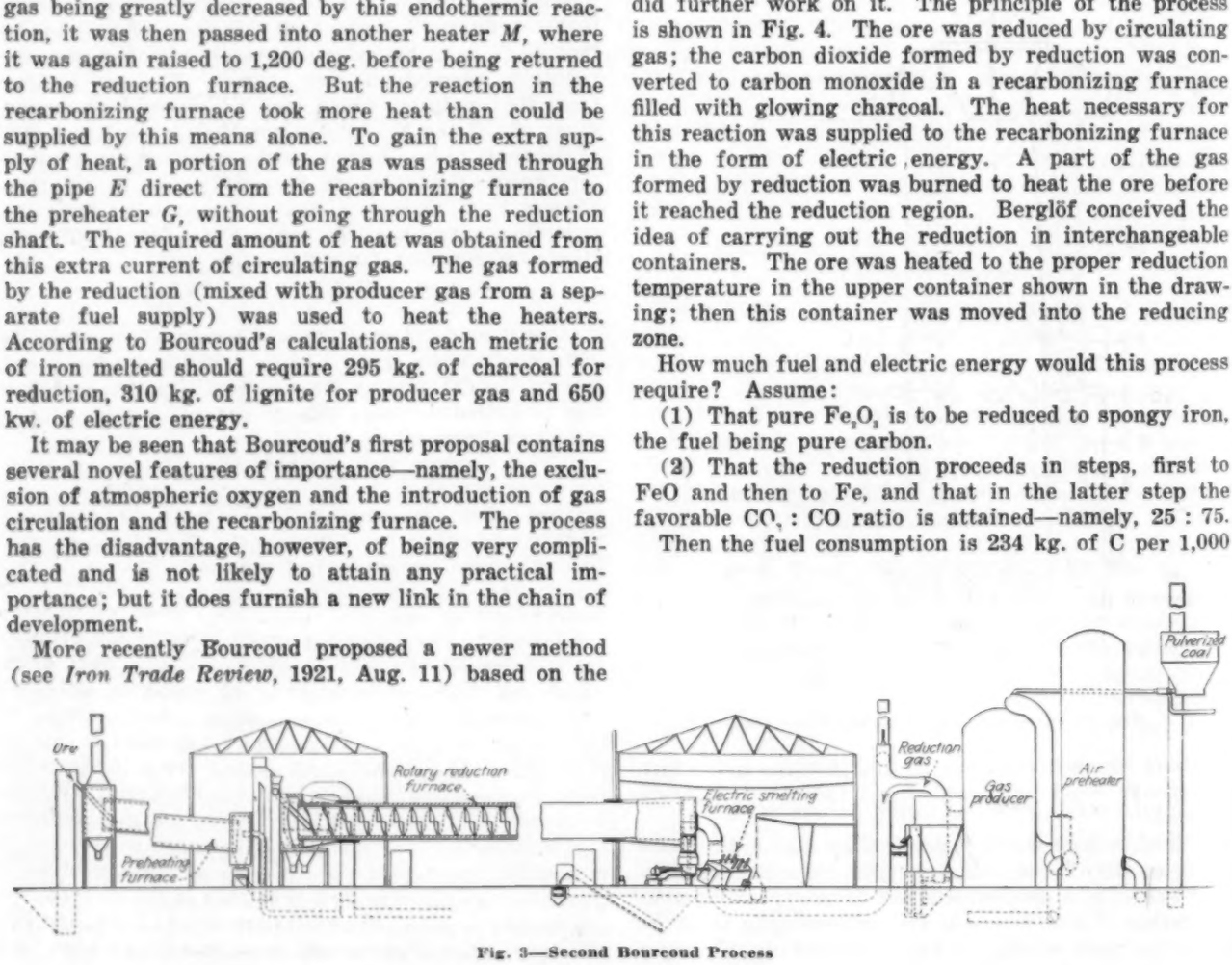


Fig. 3—Second Bourcoud Process

kg. of Fe, and the net consumption of electric energy is 700 kw. per 1,000 kg. of Fe.

The excess gas, escaping at about 800 deg., is calculated to contain 37 per cent CO_2 and 63 per cent CO and has a heat value of about 500,000 Cal. per ton, not including its heat content due to temperature. As an alternative, this amount of heat may be considered to

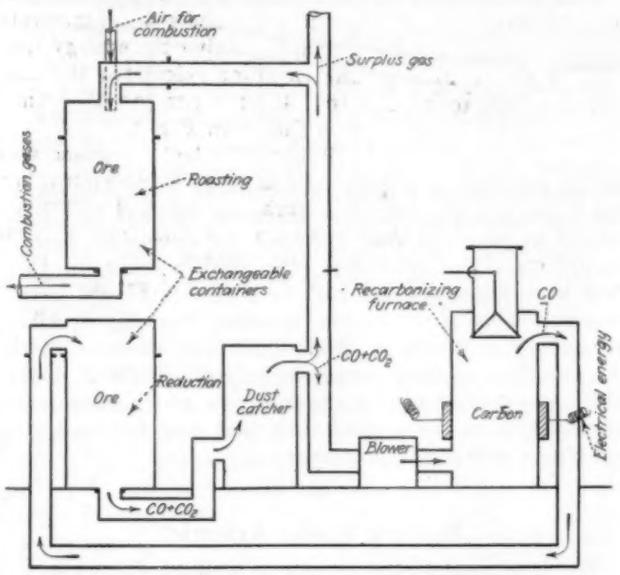


Fig. 4—Process Used by the Berglof Brothers

be used in the process and for heating the circulating gas before it enters the recarbonizing furnace.

The Wiberg Method

This method represents the latest of the gas reduction methods; the arrangement is shown in Fig. 5. This method also utilizes gas circulation, an electrically heated recarbonizing furnace and preheating of the ore as in the Berglöf method. The ore is charged into the shaft, where it is preheated in the upper half and reduced in the lower. The particular novelty in the method is that the circulating gas is withdrawn from the reduction shaft at such a point that the gas formed by reduction is carried a little farther up the shaft past the gas outlet and there effects further reduction; and the combustible constituents remaining in the gas are not burned till after this. If a calculation is made on the same assumptions as for the Berglöf method, but bearing in mind the different arrangement, it is seen that the reducing power of the gas in this case is better utilized before it is burned. This same plant claims to have been able to control the process so that the gas when it arrived at the combustion level contained only the amount of combustible matter required to heat the ore to the reduction temperature; in the theoretical case assumed above, the gas before combustion should then contain 67 per cent CO_2 and 33 per cent CO. Then the fuel consumption is 192 kg. of C per 1,000 kg. of Fe, and the net electric energy requirement is 570 kw. per 1,000 kg.

As stated, the figures given for electric energy requirement are net, for both the Berglöf and the Wiberg methods; that is, no allowance was made for losses in the slag. To attain any degree of certainty in estimating these losses is very difficult; probably the actual requirement would be two or three times the figures given above.

In the following paragraphs are summarized some of the circumstances which obviously have a marked influence on the success of those processes which depend on gas reduction of lump ore:

(1) The ore should be rich. Of course it is conceivable that all the foreign matter can be removed after the reduction, by screening or some other method; but such an arrangement means an added complication and expense, and moreover it must be remembered that such a purification very often involves iron losses. That is, if the ore contains FeO-bearing silicates such as hornblende, augite, garnet or knebelite, these would probably not be reduced to any great extent under the prevailing conditions, and so in the subsequent separating process they would go with the waste and thus represent a loss of iron.

(2) The mechanical properties of the ore, on which its reducibility depends, are very important. An ore

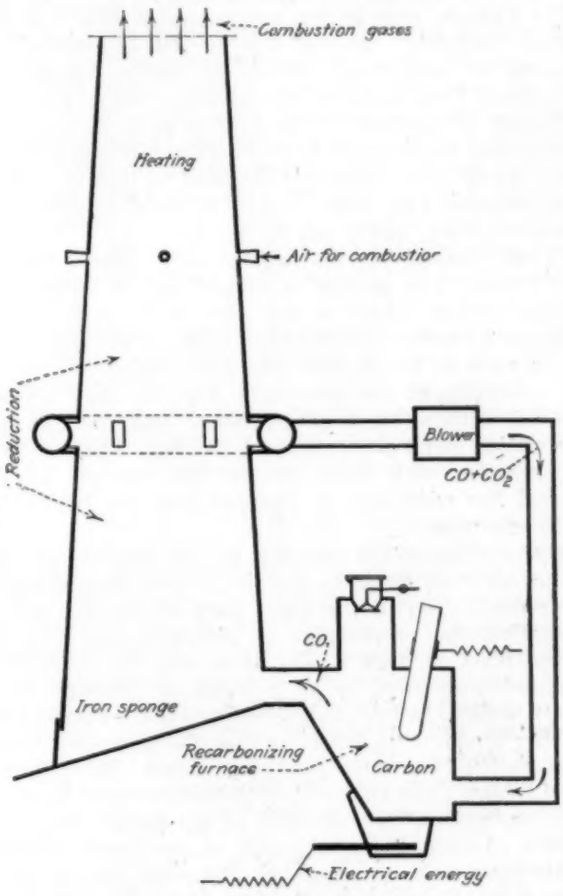


Fig. 5—Wiberg Method

that is either porous in its natural state or becomes so when heated obviously offers greater opportunity for CO to penetrate and reduce it than a very dense ore, or a poor one the particles of which are imbedded in rocks that are impervious to gases. Again, some ores seem to have a marked tendency to crumble to powder during gas reduction, which causes losses if the reduction is done in a shaft furnace. Moreover, different pieces of the same ore may show entirely different behavior toward reduction; for example, in the case of an ore with an irregularly occurring covering of dense rock it may happen that this thin layer of rock will be unfavorable to gas penetration on one piece, and this resistance to reduction will cause that piece to be much more poorly reduced than its neighbor.

The reduction time might be made so long that even

the most obstinate pieces of ore would be reduced; of course such a way around the difficulty is conceivable, but it has certain disadvantages: it would lessen the production capacity of the furnace (causing a high cost for a plant of given capacity), and moreover the heat loss by radiation increases in the same degree as the reduction time is lengthened. It should therefore be remembered that in the case of such an ore the reduction may yield a sponge that is more or less uneven as to degree of reduction. This unevenness can be overcome somewhat by suitable treatment of the product.

(3) Ores containing easily fusible minerals may be expected to offer difficulties. If the temperature for any reason happens to rise a little above the chosen reduction temperature, say, 1,000 deg., such ores have a tendency to melt at the surface, thus greatly hindering the penetration of the gas.

The Basset Process

The French trade papers announced in 1920 that the French engineer Lucien Basset had succeeded in devising an economical method of making liquid soft iron direct from the ore. Fritz Wüst, Düsseldorf, has subjected the method (or such of it as is known from patents and technical articles) to a critical examination, from which the following account is taken. (See *Mitteilungen* aus dem Kaiser-Wilhelm-Institut für Eisenforschung, 1921, vol. 3, No. 1.)

Basset worked out his method at a cement factory near Paris. The process is carried out in an inclined rotary furnace, which in this case is 40 to 50 meters long and 2.5 meters in diameter. The production capacity is said to be 25 tons per day. Other details of the arrangement are shown in Fig. 6. The furnace is fired with a blast of powdered coal, the air for combustion being preheated to 1,000 deg. The powdered ore, together with limestone and the required amount of coal for reduction, is charged into the upper end of the furnace.

The distinguishing feature of the process is that the inventor claims to be able to prevent reoxidation of the reduced iron in the lower part of the furnace by regulating the proportions of powdered coal and air in the blast in such a way that only CO is formed. If this is conceded to be possible, it remains to be seen whether the heat furnished by such a partial combustion would be sufficient so that the necessary fusion temperature for steel making could be attained. Wüst's calculation shows at once that in order to attain the temperature that prevails in the fusion zone of a Martin furnace, the combustion in the Basset furnace would have to be so regulated that some CO_2 would be formed, or, to be more exact, the ratio CO_2: CO would have to be at least 30 : 70. It may be seen from the equilibrium curves in Fig. 1 of the first part of this article (see *Chem. & Met.*, June 2, page 865) that at 1,000 deg. there could be at most 23 per cent of CO_2, and at 1,600 deg. only 6 per cent; otherwise oxidation of the reduced iron would occur. Then the slag would contain FeO and there would be a loss of iron. Meanwhile, if the sponge is mixed with excess carbon, a part of the FeO would be again reduced by this carbon during the melting operation.

Wüst calculated the heat balance for the process, assuming that the loss by conduction and radiation would be approximately 40 per cent. According to his calculation, each 1,000 kg. of iron would require 372 kg. of coal for reduction and 510 kg. of coal for heating, a total of 882 kg. This, however, is based on the assumption that the reduction coal is burned only to CO, which seems to be too conservative.

The method has aroused much discussion in France, but apparently no actual operating data have been published as yet. The writer does not know how far the method has progressed beyond the experimental stage.

From this review it is seen that many direct methods have been proposed. Several of them have been tried

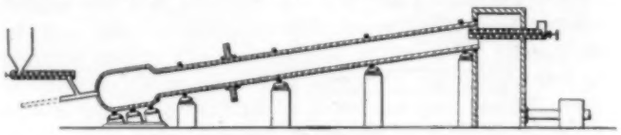


Fig. 6—Basset Process

out in practice on a more or less large scale, but up to the present time only the Höganäs method has continued in practical use, and that by reason of special conditions. The inventors who have worked in this field have therefore not had as a rule any very great success. This is not saying, however, that the problem of finding a direct method which can compete with the cast-iron method cannot be solved. Without doubt there are several among the methods which have been proposed up to the present time that may yet be developed into successful processes.

Making White Arsenic

The treatment of arsenic ore in making white arsenic at the plant of the Toulon Arsenic Co. is relatively simple, according to George J. Young, associate editor of the *Engineering and Mining Journal-Press*. Two classes are made, selected or picked ore containing 15 to 20 per cent arsenic and 17 to 20 per cent sulphur, and lower-grade ore, which is to be concentrated. The concentrator equipment consists of a Herman mill equipped with a 16-mesh discharge screen, eight Deister-Overstrom tables (three roughers and five slimers), hydraulic classifier and Callow cones. The concentrates are partly dewatered by a Dorr classifier and are dried by passing through a worm conveyor, the outer shell of which is heated by an oil flame. The ore is crushed to ½ in. before going to the Herman mill. Picked furnace ore is crushed and sized to a maximum of ⅛ in. by a revolving trommel before going to the furnace.

Roasting is accomplished in two six-hearth Wedge furnaces. The upper three hearths of each furnace are provided with separate flues and dampers so as to control the roasting positively. Roasting is at a relatively low temperature, 1,400 deg. F., and little or no extraneous fuel is used. The gases pass to cylindrical brick dust chambers, and are then conducted to four balloon flues or condensers in series, the residual gases being discharged by a stack. The arsenic trioxide is deposited in the flues.

The furnace ore consists of pyrite, arsenopyrite, accompanying sulphides, and gangue. Its analysis approximates 18 per cent sulphur, 15 per cent arsenic, 20 per cent iron and 18 per cent "insoluble." Both lead and zinc occur in small amounts, as well as gold, silver and copper. The calcine carries about 2 per cent arsenic, and is shipped to custom smelters. The recovery of arsenic is 85 per cent, the arsenic trioxide being in the amorphous or finely divided form. A small amount of iron and "insoluble" is retained in the crude arsenic trioxide, which is from 95 to 96 per cent pure.

A Glimpse of Trade Association Activity

The Annual Meeting of the Manufacturing Chemists Association Offers a Survey of Constructive Effort

THE annual meeting of the Manufacturing Chemists Association, held June 4 at the Whitehall Club, New York City, brought in review a varied and constructive group of activities. The association's work follows the three lines of common interest of its members: first, problems essentially technical in nature, involving relations with railroads and other industries; second, protection of the industry from hostile legislation, and third, the exploration of fields for additional service in the way of standardization and waste elimination.

Method of Organizing Work

It is customary procedure for the association to form a committee of members to carry out the work on any problem, and so when a problem is discussed below there must be visualized back of it a group of chemical engineers working intelligently together. In co-operative effort lies the value of such work.

Investigation of carboys has been continued, with special emphasis on an endeavor to eliminate weak carboys during manufacture, to improve carboy packing and loading and also with regard to the possibility of using glass-lined carboys. These investigations will complement reports already made on carboy stoppers, openings, etc., some of which have been published in *Chem. & Met.*

Investigations of muriatic acid tank cars has been begun and will probably require years to complete in order that data on life and maintenance cost may be obtained.

Dilute Sulphuric in Drums?

Sulphuric acid shipments in drums have caused considerable trouble when weak acid has been transported. After an investigation a committee has recommended to the Bureau of Explosives that no acid weaker than 65 deg. Bé. (88.6 per cent H_2SO_4) be shipped in drums.

Another recent development of interest, the multiple unit tank car, has had a somewhat summary treatment at the hands of the railroads. They have not given it the same rating as the ordinary tank car. The association made representations to the Interstate Commerce Commission and was sustained in its contention that the rating should be identical.

These problems illustrate well the type of problem that is undertaken by the association. Unlike the lime association, there is no single technological process that would be of general interest to all members, and the association has therefore devoted its attention to the container and shipment problems, to the standardization of laboratory apparatus and to an investigation of useful new types of earthenware and stoneware equipment.

Legislative activity has not been great in fields that touch the chemical industries, but constant vigilance is necessary to prevent the passage of ill-advised or detrimental laws in federal or state legislatures. Patent legislation, regulations regarding shipment of commodities, punishment of commercial bribery, creation of a prohibition unit in the Treasury Department (thus making the Prohibition Commissioner responsible to the Secretary alone), stream pollution, tariff and duties—all of these subjects have been considered by Congress and appropriate recommendations made by the association.

Cost Accounting Investigation

Perhaps the most important matter under consideration at present is the possibility of developing a uniform cost system. It has not been decided yet to undertake such a study, but the membership will vote on it in the near future. The benefits that have accrued to other industries as a result of these studies will undoubtedly overbalance the greater difficulties in chemical costs. It was the sentiment of a number of those at the meeting that this wise investigation would be carried out.

The luncheon that followed the business session was attended by fifty members and was addressed by C. C. Concannon, chief of the Chemical Division of the Bureau of Foreign and Domestic Commerce. Mr. Concannon told of the opportunities of foreign trade for American chemical industries. He pointed out that the industry had more than justified its existence, that it was taking care of practically all domestic demands and was in addition exporting extensively, oftentimes successfully competing in strongholds of foreign competitors.

E. J. Herring, commercial attaché at Berlin, also addressed the members and gave a vivid picture of conditions in Germany based on years of contact. He was questioned at great length by the members on the decreased productivity of German labor, on the effect of the Dawes plan and on the change in the French Government.

Elon H. Hooker, of the Hooker Electrochemical Co., was re-elected president, and the other officers were as follows: C. Wilbur Miller, Davison Chemical Co., and M. C. Whitaker, U. S. Industrial Alcohol Co., vice-presidents; S. W. Wilder, Merrimac Chemical Co., treasurer; John I. Tierney, secretary; executive committee: Henry Howard, Grasselli Chemical Co., chairman; A. G. Rosengarten, Powers, Weightman & Rosengarten; Charles L. Reese, du Pont; H. H. Dow, Dow Chemical Co.; G. G. Ackerson, General Chemical Co.; F. H. Ackerson, National Aniline & Chemical Co., and W. M. Bower, Henry Bower Chemical Manufacturing Co.

Canada Nearly Equals Paper Production in United States

Newsprint production in the United States in April totaled 128,249 tons, against 119,098 tons in March. Shipments were 127,505 tons, against 118,604.

Output of Canadian mills totaled 115,572 tons, against 112,538 tons, while shipments were 113,931 tons, against 111,262 tons.

Production for the first 4 months shows a gain of 1 per cent over 1923, total of 495,396 tons, against 488,396 tons. Canadian mills gained 12 per cent in the same period, producing 449,649 tons in 4 months, against 399,993. Combined production of United States and Canada increased 6 per cent, totaling 945,645 tons, against 888,069 tons.

"Sterling" Marks for Platinum

A Discussion of the Proposed Legislation Covering the Marking of Platinum and Its Various Alloys in Order That Buyers May Have a Guarantee of Quality

By J. M. Hill

THE various articles that have appeared in the *Jewelers Circular* and other trade papers during 1923 and 1924 relative to the enactment of a law prescribing what alloys may be stamped "Platinum" indicate that the jewelry industry is not entirely agreed as to just what should be classed as platinum. One group wishes nothing but the platinum-iridium alloy stamped "Platinum"; another to allow all alloys carrying 75 per cent or more platinum metals to be classed as platinum, and still a third wishes to class all white alloys containing any of the platinum metals as platinum. Just why a national stamping law should be necessary to control the present practices in the sale of platinum jewelry does not appear clear. It would seem that, if the suggestion offered by the *Jewelers Circular* (vol. 86, No. 19, p. 105, June 13, 1923), as quoted below, were incorporated as one of the requirements to be subscribed to in obtaining a state or municipal license to sell jewelry, and this license be made revocable for non-compliance with all its provisions, the solution of the present difficulties would be reached.

The suggestion is: "As we see the situation, the only way in which the buyer of platinum jewelry can fully protect himself is to demand that the manufacturer who sells him platinum jewelry disclose, first, the exact percentage of the pure platinum contained; second, the percentage of any other metals of the platinum group that it may contain, and then the percentage of gold or base metal that entered into its composition. This the buyer is entitled to and this no honest manufacturer, in view of the present situation, should have any hesitation in giving to him. . . . The retailer should know exactly what the quality of the metal is in the merchandise that he handles, and knowing this, should be willing to inform his customers, selling the article for exactly what it is."

Assumed Assay of Crude Platinum

Country	Platinum	Palladium	Iridium	Osmium	Rhodium, Ruthenium, etc.
Australia:					
New South Wales	75.9	...	1.3	....	1.3
Tasmania	....	...	58.1	33.5	3.0
Canada	72.1	0.2	1.1	....	2.8
Colombia	86.2	0.5	1.1	....	1.4
Japan	0.2	...	49.8	37.3	3.9
Papua	....	...	58.1	33.5	3.0
Russia	83.5	1.9	1.9	3.0	0.6
United States	85.5	0.6	1.1	1.3	1.0

Mr. Engelhard, of Baker & Co., Inc., has supplied valuable data (*Jewelers Circular*, vol. 86, p. 63, June 20, 1923) to the discussion of this subject, with particular reference to the metallurgical side, and states the position of one of the largest refiners in the country in the following way: "We are in favor of a law to restrict the use of by-metals to, say, 25 per cent, and any piece of jewelry can be called platinum if it contains at least 75 per cent platinum by-metals—whatever they are. If the percentage of platinum itself is less, then the restrictions as indicated in the proposed law should commence."

At a meeting of the American National Retail Jewelers Association on Oct. 16, 1923, the following resolution was passed (*Jewelers Circular*, vol. 87, p. 87, Oct. 24, 1923):

Resolved, That it is the sense of this meeting that for the protection of the public and for the best interests of the jewelry industry, there should be adopted certain definite and workable standards which shall form a basis for the stamping of platinum articles, which are as follows:

Article I. Articles consisting of not less than 985/1000 parts pure platinum where solder is used, or 985/1000 pure platinum where solder is not used, may be marked Platinum (abbreviated "Plat."), and sold as platinum.

Article II. Articles consisting of 95 per cent of the metals of the platinum group and at least 75 per cent pure platinum, where solder is used, or 98 per cent of the metals of the platinum group and at least 78 per cent of pure platinum where solder is not used, may be sold and marked with the word Platinum, immediately preceded by the name of the other chief ingredient by weight, of the platinum group, or its abbreviation, namely, Iridium-Platinum (abbreviated Irid-Plat), Palladium-Platinum (abbreviated Pall-Plat), Osmium-Platinum (abbreviated Osm-Plat), Rhodium-Platinum (abbreviated Rho-Plat), Ruthenium-Platinum (abbreviated Ruth-Plat).

Article III. Articles containing less than 750/1000 parts of pure platinum may not be stamped with the word platinum, or any simulation or abbreviation of the name platinum.

This proposed law seems complicated, and it appears that such long abbreviations as suggested could hardly be placed on many delicate mountings made of platinum. The simpler way would seem to regulate those that sell to the ultimate consumer by the licensing suggested before, which could be done practically by the present license forces with only small additions of personnel.

The question has been mentioned by the American Institute of Chemists (Wright, T. A., "The Proposed Platinum Law Vs. the Chemist and Engineer," *Jewelers Circular*, vol. 87, p. 73, Dec. 12, 1923), but apparently neither the electrical, dental nor chemical industries have realized the bearing of this proposed legislation on their positions. It appears that all the industries using platinum should be vitally interested and should be heard before any legislation on this subject is seriously considered either by state or federal legislatures.

The points of availability of supply and relative demand are after all the most important elements in such a discussion, and it is believed that the following data should be presented as widely as possible to all interested industries.

As is well known to all, Russia was, and is potentially, the largest producer of crude platinum, Colombia, South

Platinum Production in 1921

Country	Crude Platinum Oz.	Calculated Content of Platinum Metals: Platinum	Palladium	Iridium	Osmium	Rhodium Ruthenium, etc.	Total
Australia:							
New South Wales	249	189	...	3	....	3	195
Tasmania	1,751	.....	...	1,017	587	53	1,657
Canada	15	11	...	...	.....	...	11
Colombia	35,000	30,170	175	385	.....	490	31,220
Japan	255	1	...	127	....	8	136
Papua	360	.....	...	209	121	1	331
Russia	20,000	16,700	380	380	600	120	18,180
United States	977	835	6	11	13	10	875
	58,607	47,906	561	2,132	1,321	685	52,605

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America, ranking second, and all the rest of the world a poor third. At the present time, with Russia just commencing to come back, Colombia has attained first rank as the producer of the world's supply of crude platinum. It is equally well known that, except for a relatively small quantity of palladium and a very much smaller quantity of the other platinum by-metals recovered in copper and nickel refining, the world's supply of the platinum group metals is derived from the crude platinum produced.

In order to see the relation of the world's supply of platinum to the demand of the United States alone, let us take the estimated world's production of crude platinum and analyze it as in the accompanying table. (Hill, J. M., "Some Thoughts on the Platinum Section of the Proposed National Stamping Act," *Jewelers Circular*, vol. 88, No. 8, p. 57, March 26, 1924).

It can readily be seen that 52,600 oz. of the platinum group metals, all that the world produced in 1922, is inadequate to supply the world's demand for these metals, when it is realized that in 1921 the demand in the United States alone was for 176,148 oz.

Platinum Consumption by Industries

Chief platinum metals consumed in the United States as reported by refiners in 1921, by industries, in troy ounces

Industry	Platinum	Iridium	Palladium	Total	Percentage of Total
Chemical	12,273	34	45	12,352	7.01
Electrical	20,574	1,003	7,626	29,203	16.58
Dental	13,181	75	8,501	21,757	12.35
Jewelry	101,258	2,367	1,265	104,890	59.55
Miscellaneous	3,791	3,938	217	7,946	4.51
	151,077	7,417	17,654	176,14-	100.00

It will be seen by a study of the tables that the supply of iridium, osmium, rhodium and ruthenium is much under the minimum demand of the United States.

The question that needs careful consideration by all industries using the platinum metals, and particularly the jewelers, who advocate the 5 to 10 per cent iridio-platinum standard, is this: What effect will such a law have on the supply of the metals? Apparently platinum and palladium will not be affected materially, for the supplies of these metals are relatively large. But what of the other metals of the platinum group, the supply of which is so short?

The jewelers are the large, steady consumers of platinum metals, and their demand is the one that keeps the platinum-refining industry alive. The next largest consumer is the electrical industry, in which the yearly demand is for about 25,000 to 30,000 oz. of platinum metals, of which platinum and iridium form the bulk. The dental industry is the third largest consumer and its demand is largely for platinum and palladium. The demand for the chemical industry is small and is very largely for platinum. The miscellaneous uses are for photography, largely platinum, and pointing gold pens, for which the native or artificial iridium-osmium alloy, known as osmiridium, is used entirely, and it must be remembered that it is from the natural alloy that the world gets its iridium.

Bearing the facts presented in mind, it would seem that hastily conceived legislation will result, first, in violent upward trend of prices of the less abundant platinum metals; that the second reaction will be a wild scramble for new deposits which will yield iridium; and that the third will be a gradual settling down to the realization that the world's supply of these metals is strictly limited and that the value of all the metals of this group, as a consequence, will always remain high. The consumers of jewelry can and will pay for the higher priced alloys. The other consuming industries, however, are not in that happy state of having a customer with an unlimited purse.

Platinum Metals Recovered by Refiners in the United States in 1921, by Sources, in Troy Ounces

Source New Metals	Platinum	Palladium	Iridium	Osmiridium	Other	Total
Domestic:						
Crude	580	3	99	119	12	813
Ore	1	192	.....	...	.....	493
Gold and copper refining	2,318	1,165	11	...	.....	3,494
	2,899	1,660	110	119	12	4,800
Foreign:						
Crude	46,973	302	110	462	758	48,605
Gold and copper refining	1,919	724	66	...	256	2,965
	48,892	1,026	176	462	1,014	51,570
Total recovery, new	51,791	2,686	286	581	1,026	56,370
Secondary metals	39,131	4,887	1,776	...	.....	45,794
Grand total	90,922	7,573	2,062	581	1,026	102,164

France Controls Alsace Potash

Complete proprietorship of the Alsace potash mines has been gained by France, according to an announcement from Mulhouse late in May. Complete control was acquired by assuming the payment of 200,000,000 francs in 20 years. The situation is favorably regarded in France, as the mines are expected to return a profit of 100,000,000 francs this year.

The principal features of the proposed operations comprise working the mines for a period of 75 years by a French stock company, with provision for the workmen sharing the profits. The capital of this new organization will be divided, 50 per cent to be provided by agricultural syndicates that may choose to interest themselves therein, 10 per cent to French industries using potash salts in one or another of their forms, 5 per cent to those of the Haut-Rhin and the Bas-Rhin and Moselle departments that may have suffered war damages, 15 per cent to various departments and communes of Alsace and Lorraine, 15 per cent to former shareholders of Lorraine and French citizens who may have held stock in the former companies operating these deposits and 5 per cent to the personnel of all grades employed in the mines.

With the collaboration of other French industries sales agencies will be established in a manner that is expected to regulate and if necessary control the price. Finally, of the entire quantities of potash available for sale and distribution a definite proportion is first to be put at the disposition of French farmers.

Use of High-Pressure Steam

In *Chemiker-Zeitung*, vol. 48, p. 253, April 23, 1924, the use of high pressure steam, especially in the pulp and paper industry, is discussed by Gleechmann. On account of the greater efficiency of high-pressure steam for power generation, back pressure should be applied if possible instead of condensation. Any excess power developed in this way can be converted into electrical energy and sold. Various types of high-pressure boilers (up to 100 atm.) are discussed. The Atmos boiler separates the steam from water by centrifugal force in pressure tubes. It is possible to generate power safely and economically at 30 to 50 atm. and 400 deg. C. Such minor difficulties as obtaining gage glasses and stuffing boxes suitable for these severe conditions can be overcome.

Equipment News

From Maker and User

Completely Mechanical Gas Producer

New Model Manufactured and Marketed by One of the Leading Makers of This Class of Equipment

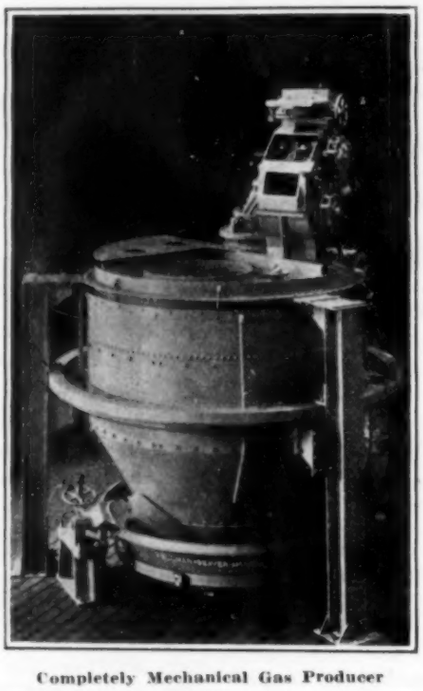
A completely mechanical gas producer, known as the "Type L," has recently been placed on the market by the Wellman-Seaver-Morgan Co., Cleveland, Ohio. The principal parts of this producer are as follows:

A brick-lined steel plate shell, carried in a circular gear casting and steel track, revolves on three chilled iron wheels, which rotate on bronze bushed steel axles supported in brackets fastened to the producer columns. A water-cooled rolled steel top plate, bolted to the column tops, has a depending circular flange plate which dips into the top water seal trough of the shell and prevents gas leakage. The top plate supports the W. S. M. heavy-duty mechanical coal feed, the gas outlet pipe elbow and the mechanical poker and its bearing casting.

The mechanical coal feed frame castings are provided with bearings in which the revolving feed control and discharge elements revolve. The rate of feeding is regulated by a hand wheel which controls the working of the upper feed element. The lower five-pocketed feed drum delivers the coal in small consecutive charges over the surface of the fuel bed in the producer.

An inclined, water-cooled, oscillating mechanical poker held in an oscillating bearing, on the top plate, reaches down into the fuel and gasification zones and maintains the fuel in a loose, uniformly level body from which the gas rises with equal freedom from all points of the surface. The incandescent particles of fuel being freed from their ash by the poker action are kept continually fresh for combining with the oxygen of the air blast, thereby permitting a high gasification speed and rate of thermochemical activity. The lower end or tip of the poker when worn by abrasion is renewable. A poker may be removed and another one with a new tip may be replaced in from 8 to 10 minutes. This renewal is required in from 4 to 5 months, according to the rate of working and tonnage of coal gasified, which may run upward of 3,000 or 4,000 tons of coal.

The ash pan below the shell receives the ashes as they pass out of the ash hopper of the shell. The pan and air blast outlet hood which it carries revolve synchronously with the shell, being operated merely through the revolving friction of the ashes. An automatic ash pan stop interrupts and holds the ash pan for three intervals, totaling one-eighteenth of each revolution of the shell. During these stoppages a twisting and shearing in the ash zone takes place, largely assisted by heavy curved ribs on the upper surface of the blast hood. This action keeps the ash bed loose and free from clinkering accretions and secures through the ashes a free uniform flow of the blast to the entire under surface of the combustion zone. By this means as well as that of the poker all "pipes" or flues for the rise of CO_2 or uncombined oxygen into the gas are prevented.



Completely Mechanical Gas Producer

The air blast is blown through the air duct and blast hood by a steam turbo blower, situated on the operating floor. The value of the turbo blower is due to its very wide range of delivery capacity, the entirely independent control of the amount of steam delivered to the producer in the air, and the very close control of the moisture admitted to the producer. A steam jet air blower is provided also in addition to the turbo blower.

The ashes are kept in a loose condition in the ash pan by a scraper bar conforming to the profile of the pan and are then ready for removal by an ash plow.

The ash plow is a steel casting pivoted on a shaft supported in a bearing casting bolted to the foundation. A control hand wheel of the plow admits of lowering the plow into the ashes to such a depth as to secure the ejection from the ash pan at the same rate that they are delivered into the ash zone, depending on the rate of feeding of coal.

The producer is driven by an electric motor, mounted on a bracket of the machinery column and working through a flexible coupling and a double worm gear reduction, running submerged in oil in ball bearings of an oil-tight case.

The producer entire is self-contained and stands on its foundation, independent of the building. Space is provided on the rim of the top plate to receive and support the edges of the adjacent plates of the operating floor of the gas house, thereby reducing the number of floor beams.

The principal dimensions of the producers are as follows:

	No. 8	No. 10
Producer diameter inside brick lining, ft.	8 ft. 0 in.	10 ft. 0 in.
Capacity per hour, continuous operation	Up to 2,750 lb.	Up to 4,000 lb
Capacity overload, peak load periods	3,600 lb.	5,000 lb.
Height, floor to top of charging floor beam	9 ft. 10½ in.	10 ft. 8½ in.
Height, over all	16 ft. 1½ in.	17 ft. 2½ in.
Width and length of producer house bay	15 ft. 0 in.	18 ft. 0 in.
Outlet gas flue, net diameter	2 ft. 10 in.	3 ft. 4 in.
Common clay fire-brick, standard shapes	2,340	3,320

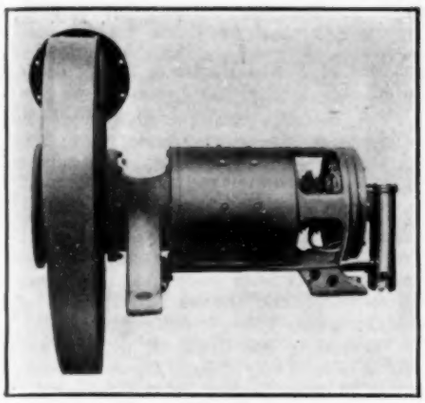
The high gasification capacity and ability to run in continuous operation, with no periods of cleaning fires and breaking down of clinkers, is due to the combination of the following distinctive features:

1, Adjustable control, continuous, mechanical coal feeding; 2, oscillating poker working of the fuel bed and fire zone; 3, intermittent periodic twisting and shearing of the ash zone; 4, continuous discharge of ashes at the rate of their production; 5, independent control of the volume and pressure of the air blast and the steam supply for humidifying the blast; 6, proportioning the various parts of the producer to secure simplicity of construction, ease of replacement of parts susceptible of wear, and very low working loads on all parts, selection of the best materials for the construction and a continuous lubrication of all moving pieces.

Plastic Fireclay Material

Several manufacturers of refractories have recently placed on the market plastic materials for use in patching furnace settings or building monolithic furnace linings. One of the most recent of these to attract attention is that made by A. P. Green Fire Brick Co., Mexico, Mo., called "Quick-Pach."

This material is a plastic fireclay made from the same flint fireclays that are used by this company in making firebrick. It is self-bonding, does not shrink or expand, and if properly applied will stand heat up to 3,100 deg. F. It is claimed that a lining or repair



Motor-Driven Centrifugal Air Compressor

of this material presents a lasting air- and gas-tight surface. The material can also be used for arches, door linings, baffles, jambs and special shapes.

Centrifugal Air Compressor

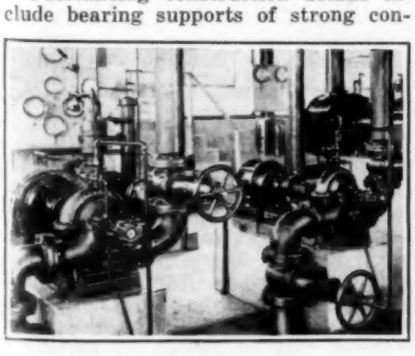
A new design of single-stage centrifugal compressor, the outstanding features of which are strong construction, accessibility, improved pressure characteristics and higher efficiencies, has been perfected by the General Electric Co. and is now on the market.

The new compressors are of two types: single and double inlet. The single-inlet type is designed for the more general use, the double-inlet variety being necessary only when the ratio of impeller inlet and exit diameter reaches a design value demanding the use of the double inlet to function properly.

The machines are available in capacities from 500 to 75,000 cu.ft. per minute at 0.75 to 6 lb. pressure. They are provided with oil pumps designed to furnish plenty of oil to the bearings. Capped holes in the tops of bearing linings are eliminated, preventing the entry of dust into the lubricating system. A heavy hinged cast-iron cover is provided on one side of the middle bearing bracket, which may be lifted to inspect the return flow of oil from the lubricating system.

The pulsation point of these machines occurs at very light loads. The efficiency curves are very broad, thus showing an improvement over older types. The no-load power consumption of the new machine is between 60 and 70 per cent of that required for machines of previous design.

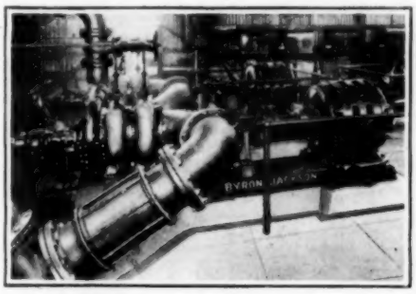
Outstanding construction details include bearing supports of strong construction, the casing being attached to the bearing bracket by a flange. The weight of the casing, although not great, has been distributed in such a manner as to make the unit unusually strong mechanically. This is made possible by the use of steel plates varying from ⅜ to 1¼ in. in thickness in the various parts of the compressor.



Cooling-Water Pumps in an Absorption Plant

Centrifugal Pumps in the Oil Refinery

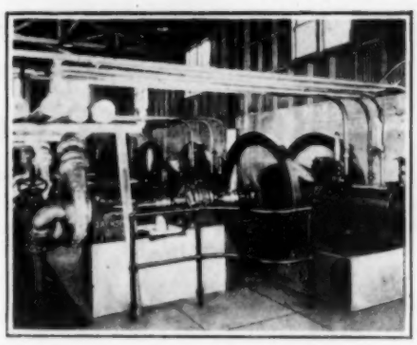
Recently it has been demonstrated that centrifugal pumps have many advantages in almost all classes of oil refinery service. In cold oil service, up to about 200 deg. F., such pumps are used for feeding crude oil to stills, transferring finished products, circulating acidulated and alkaline oils during treatment, pumping sulphuric acid and soda solutions, and, of course, fresh and salt water. For handling viscous oils, such pumps have been especially successful. The natural speed of the centrifugal pump is such that either steam turbine or electric drive may be employed, direct connecting the pump and driver, thus conserving space and power and reducing maintenance costs.



Absorption-Plant Pumps

The problem of pumping hot oils (250 to 1,000 deg. F., cracking process) is one of importance to the oil refiner, with particular reference to work in the absorption plant. In this class of service, the centrifugal pump, when properly designed, is particularly serviceable. It has no valves to fail, no pistons, cylinders or sliding surfaces with close clearances to deteriorate with heat and wear. It has ample clearance between moving parts; only the bearings need lubrication, and these are outside the pump.

The Byron-Jackson Pump Manufacturing Co. manufactures pumps for these purposes. Their casings are made of a material that is claimed to be proof against the hazard of breakage from mechanical or temperature shocks. Expansion difficulties are prevented, the stuffing-box problem has been solved and the pumps may be quickly and easily cleansed of accumulations of coke. The bearings are water cooled and may be plain-ring oiling or of the roller type, with ball or Kingsbury thrust bearings. The interior condition of the pumps may be ascertained readily by inspection without dismantling. Bulletin 74, Byron-Jackson Pump Manufacturing Co., Berkeley, Calif., deals with the problems of moving oils of all types and temperatures by centrifugal pump.



Hot-Oil Absorption Pumps, With Special Suction Openings

Manufacturers' Latest Publications

Sullivan Machinery Co., 122 So. Michigan Ave., Chicago, Ill.—Bulletin 77-H. A new bulletin describing the Sullivan design of angle-compound of power-driven air compressors.

Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.—A binder containing the following late issues of this company's catalogs: Catalog 87, containing description, specifications and uses of potentiometer pyrometers; Catalog 75, on apparatus for the electrometric determination of hydrogen-ion concentration; Catalog 680, on the Macbeth illuminometer, an instrument for measuring the intensity of illumination or the brightness of a source of light; Bulletin 872, on the influence of flue gas temperature on power plant operation; Bulletin 871, on the use of electrical instruments in measuring temperature in generators, transformers and cable systems; Catalog 90, on the Hump method for the heat-treatment of steel.

National Tank & Pipe Co., 151 Columbia Blvd., Portland, Ore.—Catalog 24. A new complete illustrated 116-page catalog of wooden tanks and pipes for use in chemical and metallurgical plants.

Crouse-Hinds Co., Syracuse, N. Y.—Two booklets, one on the subject of special conduits for concealing in concrete and the other on various types of electric hand lanterns.

The Foxboro Co., Inc., Foxboro, Mass.—A new folder on the design of liquid level gages.

Sullivan Machinery Co., 122 So. Michigan Ave., Chicago, Ill.—Bulletin 70-X. A new bulletin describing the design and use of the Sullivan compressed air spader.

Cleveland Crane & Engineering Co., Wickliffe, O.—Catalog 3. A large new illustrated catalog on the design and use of the Cleveland Electric Tramrail system of conveying.

W. S. Rockwell Co., 50 Church St., New York City—Bulletin 258. This is a bulletin giving specifications, uses and photographs of the Rockwell air-tight blast gate, which has numerous uses throughout the process industries, as well as in the power plant.

The Industrial Gas Equipment Co., New Haven, Conn.—A catalog of the Reeves Gas-Air pre-mixer, a device for proportioning gas and air for combustion which has been described in this department of *Chem. & Met.*

Chase Metal Works, Waterbury, Conn.—"How to Order Brass," a booklet pointing out what properties in brass are desirable for different typical uses and telling how to order such material so that the manufacturer will understand just what is wanted.

Roller-Smith Co., 233 Broadway, New York.—Bulletin 10. A catalog of small-size electrical instruments for control panels.

Harold E. Trent, 1524 Chestnut St., Philadelphia, Pa.—A leaflet on the "Trent" automatic control system for controlling temperature of gas, oil, steam, air or electrical heated devices.

Petroleum Iron Works Co., Sharon, Pa.—"Steel Barrels and Drums," a catalog of pressed steel products, including the G-E-M bilged steel barrel.

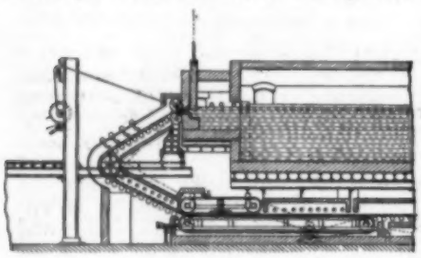
Review of Recent Patents

Carburetting Water Gas With Heavy Oils

Heavy oils or residuums giving as much as 15 per cent coke have not been extensively used for carburetting water gas, because the coke residue tends to interfere with the fire in a fuel bed blasted from below, or if introduced in the carbureter tends to choke the checkers. However, if secondary air is introduced near the top of the fuel bed during the blasts so that a ring of highly incandencent fuel is formed, the heavy oil may be sprayed onto this hot ring in spots during the runs with good results. As the coke from the oil is formed only in spots, it is consumed during the succeeding blasts. (1,493,458, Owen B. Evans, of Philadelphia, Joseph A. Perry, of Swarthmore, and Leon B. Eichengreen, of Ardmore, Pa., assignors to United Gas Improvement Co., Philadelphia, May 6, 1924.)

Continuous Plate Glass Process

Manufacture of plate glass from a continuous tank furnace is described by John H. Fox, of Pittsburgh, Pa., in Patent 1,492,975, assigned to the Pittsburgh Plate Glass Co., May 6, 1924. The sheet of plate glass has fire-finished surfaces that require no further smoothing or polishing. Glass from the tank furnace outlet passes between a pair of driven water-cooled sizing rolls that determine the thickness and govern the speed at which the sheet is formed. The sheet is supported on a series of rolls while the upper surface is fire-polished; the sheet then passes



Continuous Plate Glass Machine

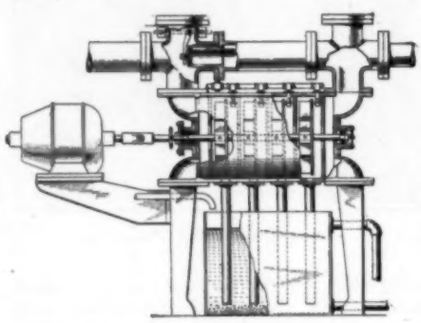
around a large roll and reverses its direction so that the finished side is supported while the other side is fire-polished. At this point the sheet is supported on a flat conveyor belt so that the finished sheet is flat. Carbon, asbestos or highly polished Nichrome is used for surfaces in contact with the hot glass, in order to avoid markings on the glass surface.

Treating Acid Sludge

Disposal of acid sludge from petroleum refining by converting it into a liquid fuel is proposed by Emerson C. Higgins, Jr., of Tulsa, and Orsino C. Smith, of Sand Springs, Okla. Acid sludge is mixed with 5 to 25 per cent hot water and agitated with live steam in a lead-lined conical-bottomed container. On settling, three layers form, acid oil on top, acid cake in the middle and weak acid on the bottom. The latter is drawn off to storage tanks. The remaining mixture of acid cake and acid sludge is neutralized by agitation with an alkaline solution, the layer of water-soluble sulphonates and sulphates that forms being removed at intervals. After a final settling, the residue after removing the sulphonates will be a homogeneous mixture, all the asphaltic material having been dissolved in the oil. It may be used as fuel, having a calorific value of 14,000 to 18,000 B.t.u. per lb. (1,487,240, one-half assigned to Cosden & Co., Tulsa, March 18, 1924.)

Tar Extractor and Scrubber

For conveniently cleaning producer gas, Albert L. Galusha, of Sharon, Mass., has developed a rotary tar ex-



Rotary Tar Extractor

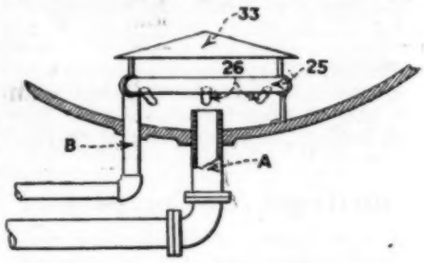
tractor and scrubber in which the rotating element also serves as a blower, thus reducing the power consumption. As shown, a series of blower elements or rotors are mounted on a single shaft, each rotor operating in a compartment formed by a diaphragm with a central opening. In the top of each compartment is a pipe that introduces just enough water to form a film on the inside of the casing. As the gas strikes the rotor, it is set in motion and the centrifugal force throws the tar and heavier suspended particles against the water film, which carries them out through an outlet in the bottom of the casing leading to a tar settling tank. Owing to the very small clearance between the rotor and the casing the cleaning action is thorough. (1,491,794, April 29, 1924.)

Countercurrent Extractor

An automatic, continuous, countercurrent extractor is formed by combining the principles of countercurrent leaching and of vacuum filtration. Agitator troughs and rotary vacuum filters alternate in a series of units so arranged that the solid material introduced in the first trough flows by gravity through the succeeding units, the solvent or leach liquor being pumped countercurrent. (1,492,656, J. W. Turrentine, of Santa Barbara, Calif., dedicated, by mesne assignments, to the people of the United States, May 6, 1924.)

Handling Viscous Fluids

A system of handling viscous fluids by means of local heating of only a small fraction of the fluid in the storage reservoir has been developed by Homer H. Norton and Elmer E. Hobbs, of Philadelphia, Pa. In the illustration, *A* represents the draw-off pipe at the storage reservoir. Just above the outlet is another pipe *B* in the form of a



Handling Viscous Fluids

ring 25, with several nozzles 26 directed toward the outlet. A portion of the oil being drawn off is circulated through a heater and discharged under pressure through pipe *B* and the nozzle ring. This superheated fluid heats and reduces the viscosity of the surrounding cold fluid in the tank. Upward motion of heated fluid is prevented by hood 33 over the nozzle ring. One heating system may serve for several tanks. In starting up cold the fluid remaining in the heater can be heated and the pumps started. If the piping is not too small, the heated fluid will gradually penetrate to the storage tank. (1,492,742, May 6, 1924.)

Vulcanizing Dipped Rubber Articles

Two separate baths are used by Thomas W. Miller, of Ashland, Ohio, in the production of dipped rubber goods. The baths are rubber cements of the desired consistency, sulphur being added to one and an organic accelerator to the other. In addition, either or both baths may contain a metallic oxide, other fillers and colors. The form is dipped alternately in the baths, the first and last coats being formed in the accelerator bath, as it has been found that the organic accelerator will penetrate the layer of stock containing sulphur. Vulcanization is effected at a temperature of 150 deg. F. or higher. (1,493,370, May 6, 1924.)

Refining Crude Turpentine

Crude byproduct turpentine obtained in the manufacture of soda and sulphate pulp from pine and coniferous woods is contaminated with coloring materials and ill-smelting compounds such as methyl mercaptan and allyl mercaptan. According to Charles A. Jobson, of Lock Haven, Pa., the crude material may be refined by agitating with 1.5 parts by volume of water and 0.75 part by volume of a 4 deg. Bé. bleach liquor or its equivalent in sodium

hypochlorite. Gaseous products of disagreeable odor are eliminated and part of the color passes to the aqueous solution. After about an hour the entire volume of liquid is run to a still and steam-distilled. The turpentine that separates in the distillate corresponds closely in boiling points, specific gravity and other constants to the best commercial grades. (1,493,454, assigned to New York & Pennsylvania Co., Lock Haven, Pa., May 6, 1924.)

Phosphate Recovery

Two methods have been proposed by Charles Bramson, of Joliet, Ill., for the recovery of the phosphoric acid that is lost in the press cake when purifying crude phosphoric acid by the addition of lime. The press cake analyzes when dry about 50 per cent dicalcium phosphate, 17 to 26 per cent iron and aluminum phosphates, 10 per cent calcium fluoride, with some calcium sulphate, silica and moisture 10 per cent. The cake is treated with enough lime water to convert all of the dicalcium phosphate to tricalcium phosphate and an excess sufficient to convert the iron and aluminum phosphates into tricalcium phosphate upon subsequent heating. Upon calcination it is found that all the phosphate is in the form of tricalcium phosphate, which may be treated with sulphuric acid in the usual way to recover phosphoric acid. By the calcination at 700 to 900 deg. C., the calcium fluoride is rendered insoluble in sulphuric acid so that it does not interfere.

The reason for the presence of such an appreciable amount of dicalcium phosphate in the press cake is given as follows: Crude phosphoric acid is essentially a mixture of free phosphoric acid and monocalcium phosphate, the latter being in unstable equilibrium:

$$\underset{\text{monocalcium phosphate}}{Ca(H_2PO_4)_2} \rightleftarrows \underset{\text{dicalcium phosphate}}{CaHPO_4} + H_3PO_4$$

Dicalcium phosphate is soluble in phosphoric acid but insoluble in water. Accordingly, when the crude acid is partly neutralized, dicalcium phosphate precipitates out. By adding from 2 to 5 per cent of a sulphate or acid sulphate of the alkali metals at this point before filtering, the equilibrium is disturbed through the formation of calcium sulphate from the monocalcium phosphate and the dicalcium phosphate goes back into solution. The press cake now contains calcium sulphate instead of dicalcium phosphate. (1,493,099 and 1,493,100, May 6, 1924.)

U. S. Patents Issued May 27, 1924

These patents have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Vacuum-Pan Unit. Paul A. Bancel, Nutley, N. J., assignor to Ingersoll-Rand Co., Jersey City, N. J.—1,495,151.

Centrifugal Pump. Ralph Hilliard Dixon, Newark, N. J.—1,495,167.

Apparatus for Heat-Treating Metal-Coated Materials. Joseph L. Herman, Peoria, Ill.—1,495,175.

Apparatus for the Conversion of Sulphates of Alkali Metals and Alkaline Earths to Sulphide. Napoleon Arthur Laury, Rockville Center, N. Y.—1,495,187.

Fertilizer. Job Morten August Stillesen, Chicago, Ill.—1,495,270.

Process and Apparatus for Arc Welding. Richard Stresau, Wauwatosa, Wis., assignor to A. O. Smith Corporation, Milwaukee, Wis.—1,495,272.

Composition of Matter for Foams. James M. Jennings, Elizabeth, N. J., assignor to Standard Development Co.—1,495,308.

Method of Determining the Amount of Solubles in Liquids. Edward C. Walker, Kinloch, Mo.—1,495,314.

Water-Softening Apparatus. John E. Caps, Wilmette, Ill.—1,495,317.

Apparatus for Electrical Precipitation of Suspended Particles From Gases. Charles H. Weiskopf, Santa Monica, Calif., assignor to International Precipitation Co., Los Angeles, Calif.—1,495,363.

Process of and Apparatus for the Manufacture of Sulphate of Lead. James Gitsham and Harold Robert Evershed, Launceston, Tasmania, Australia.—1,495,410.

Refractory Arch for Fireboxes. Edward S. Nichols, Detroit, Mich., assignor to American Arch Co.—1,495,496.

Treatment of Feldspar, Leucite and the Like. Franz A. Rody, Newark, N. J., assignor to Metallurgical Co. of America, New York.—1,495,498.

Automatic Siphon. Charles L. Gravett, Roanoke, Va.—1,495,513.

Apparatus for Purifying and Cooling Combustible Gas. William W. Odell, Minneapolis, Minn.—1,495,525.

Means for Dehydrating Liquids Such as Coal Tar, Crude Petroleum and the Like. Sigurd Walfrid Albert Wikner, Newcastle-upon-Tyne, England, assignor to Newcastle-upon-Tyne & Gateshead Gas Co., Newcastle-upon-Tyne, England.—1,495,543.

Chemical Compound for Removing Baked Enamel Paint. Day F. Clark, Harrisburg, Pa.—1,495,547.

High Nitrogen Grade Cyanamide-Granule-Making Process. Gaston Lefort des Ylouses, Paris, France, assignor to La Société l'Azote Francais Siège Social, Paris, France.—1,495,551.

Process of Making Hydrochloric Acid and Salt Cake. Caesar A. Grasselli, Cleveland, Ohio, assignor to Grasselli Chemical Co., Cleveland.—1,495,555.

Apparatus for Treating Gases. Harry D. Ranklin, Coronado, Calif.—1,495,563.

Silicated Separator and Process of Making the Same. Raymond C. Benner, Bayside, N. Y., assignor to Union Carbide & Carbon Research Laboratories, Inc.—1,495,568.

Apparatus for the Distillation of Coal and Other Bituminous Fuels. Georg Cantieny, Nuremberg, Germany, assignor to Kohlenscheidungs-Gesellschaft m.b.H., Nuremberg, Germany.—1,495,573.

Method of Producing Chlorinated Rubber. Thomas A. Edison, Llewellyn Park, West Orange, N. J.—1,495,580.

Rotary-Base Discharging Device for Cement Furnaces and the Like. Etienne Chaudiere, Liege, Belgium.—1,495,631.

Nitrogen Fixation. Stephen L. Tingley, New York.—1,495,655.

Electrolyzer for Producing Hydrogen and Oxygen. Giacomo Fauser, Novara, Italy.—1,495,681.

Process of Producing Edible Fat. George Grindrod, Oconomowoc, Wis., assignor to Carnation Milk Products Co., Chicago, Ill.—1,495,734.

Electrode and Method of Jointing Same. Bethune G. Klugh, Chicago, Ill., assignor to Federal Phosphorus Co., Birmingham, Ala.—1,495,749.

Effecting the Recovery or Separation of Colloidal Matter From Liquids. Thomas Walter Barber, Anerley, London, England.—1,495,765.

Measuring and Spraying Apparatus for a Volatile Fumigant. Mortimer Jay Brown, Niagara Falls, N. Y., assignor to the Pacific R & H Chemical Corporation, Los Angeles, Calif.—1,495,77.

Process of Making Gas. Reginald H. Burdick, Flushing, N. Y.—1,495,776.

Process of Calcining Rocks. Joseph B. Shaw and George A. Bole, Alfred, N. Y.—1,495,813.

Process for Making Fat-Splitting Sulphonic Acids and Product. Robert E. Divine, Cincinnati, Ohio.—1,495,891.

Process of Making Barium Chloride. Louis C. Drefahl, Lakewood, and Charles H. Sakryd, Cleveland, Ohio, assignors to Grasselli Chemical Co., Cleveland.—1,495,893.

Process for the Production of Metal Powder or Dust. Minton H. Newell, Palo Alto, and Evald Anderson, Alhambra, Calif., assignors to International Precipitation Co., Los Angeles, Calif.—1,495,961.

Fractional Condenser. Karl Fuchs, Orsova, Rumania.—1,495,972.

Tin Oxide for Enamels

By treating stannate liquors with carbon dioxide or bicarbonates, a hydrated tin oxide of extremely fine texture is obtained. In spite of careful washing it retains 3 to 5 per cent alkali, however, and when used as an opaquing agent in enamel batches, this alkali reacts to diminish the covering capacity of the oxide. By adding sodium silicate to the stannate solution before precipitation, from 2 to 6 per cent SiO_2 may be precipitated with the tin oxide and the silica tends to counteract the effect of the alkali. The alkali has the further undesirable effect of diminishing the gloss of the enamel. Addition of about 1 per cent sodium chloride overcomes this. (1,492,578; Josef Perino, of Sewickley, Robert D. O'Neil and Frank G. Gramm, of Coraopolis, Pa., assignors to Vulcan Detinning Co.; May 6, 1924.)

Electrolytic Chromate Process

With ferrochromium anodes and lead cathodes in a sodium carbonate bath without a diaphragm, sodium chromate is formed upon electrolysis. A current density of several hundred amperes per sq.m. may be used. After all the carbonate has been used, electrolysis continues with the formation of bichromate. Instead of ferrochromium, the anodes may be made by heating a mixture of chromite and carbon to a temperature sufficient to reduce the oxide of chromium partly or entirely. (1,492,636; Adolphe Jouve and André Helbrouner, of Paris, France; May 6, 1924.)

Soap Powder From Low-Grade Materials

Fish oils and similar liquid oils and fats are saponified and the soap mass heated in a closed vessel up to about 200 deg. C. A steam vent is then opened so that part of the water can distill off, without relieving the pressure. During this concentrating process, polymerization takes place and a high-grade soap-powder may be made by spray-drying the concentrated soap. (1,492,476, Jakob Lund and Hermann Hausamann, of Frederikstad, Norway, assignors to de Norske Fabriker, Christiania, Norway; April 29, 1924.)

Important Technical Articles in Foreign Literature

"Synthesis of Ammonia at High Pressures. *W. Moldenhauer.* Discussion of the Claude and the Haber processes, with particular reference to the relation of temperature and pressure to yield. *Chemiker-Ztg.*, April 15, 1924, pp. 233-4.

"Synthol, a New Synthetic Motor Fuel." *F. Fischer* and *Hans Tropsch.* Synthol is made by reduction of CO (from commercial water gas) in contact with Fe filings and K_2CO_3 under 150 atm. pressure at 400 to 450 deg. It contains higher and lower acids, aldehydes, alcohols, esters and hydrocarbons. Mixed 1:1 with benzol it performs well. *Brennstoff-Chem.*, 1924, p. 276; *Chemiker-Ztg.*, April 15, 1924, p. 235.

"An Epidemic of Poisoning From Food From Tinned Iron Ware." *Heinrich Zellner.* A large number of cases of severe illness occurred in a factory where food was carried hot in tinned iron ware from a nearby restaurant. The cause was traced to arsenic from the tin where rust had penetrated the tin coating. Rust should be avoided by thorough plating. Since tin cannot be had commercially absolutely free from arsenic, there should be a legal limit to the arsenic content. *Chemiker-Ztg.*, April 5, 1924, pp. 205-6.

"Steam Economy in Sugar Factories." *Linsbauer. Z. Zuckerind. Cech. Slov. Rep.*, 1924, p. 187; *Chem.-techn. Uebersicht*, April 12, 1924, p. 63.

"Heat Economy in Sugar Factories." *Ksir. Z. Zuckerind. Cech. Slov. Rep.*, 1924, p. 181; *Chem.-techn. Uebersicht*, April 12, 1924, p. 63.

"The Russian Sugar Industry." According to latest reports, only a few refineries were working in Russia, and they were operating at a loss. *Journ. fabr. sucr.*, 1924, No. 11; *Chem.-techn. Uebersicht*, April 12, 1924, p. 63.

"Loading Devices in Modern Martin Mills." *Ernst Blau.* An illustrated description of various modern material handling devices. *Chemiker-Ztg.*, April 10, 1924, pp. 222-5.

"Pressure Evaporation." *Ulrich.* Great savings are claimed for a new system of taking advantage of the temperature gradient (125 to 105 deg. C.) in the thickener in sugar refineries. This temperature drop gives a back steam pressure of 1.25 atm. *Centralblatt Zuckerind*, 1924, p. 318; *Chem.-techn. Uebersicht*, April 5, 1924, p. 59.

"Decolorization With Norite and Other Charcoals. *Sauer. Int. Sugar J.*, 1924, p. 27; *Chem-techn. Uebersicht*, April 5, 1924, p. 59.

"Steam Turbines in Sugar Refineries." *Mrasek. Z. Zuckerind. Cech. Slov. Rep.*, 1924, p. 128; *Chem.-techn.* Uebersicht, April 5, 1924, p. 59.

"Wood Cellulose." *E. Heuser* and *S. S. Aiyar.* New proofs of the identity of wood cellulose and cotton cellulose. *Z. angew. Chem.*, 1924, pp. 27-8; *Chem.-techn. Uebersicht*, April 5, 1924, p. 60.

"Germany's Foreign Trade in Chemicals and Allied Products in 1923." *Chemiker-Ztg.*, April 5, 1924, pp. 209-12. (To be concluded.)

"The Progress of Dye Chemistry in 1923." *I. F. Mayer.* (To be concluded.) *Chemiker-Ztg.*, April 8, 18 and 22, 1924, pp. 213-4, 242-3 and 250-1.

"Recent Investigations in Colloid Chemistry." *A. Gutbier.* Thermal and electrical methods have been applied to the preparation of colloidal arsenic, mercury and bismuth. *Chemiker-Ztg.*, April 22, 1924, p. 252.

"Use of Rubber Latex in Paper Sizing." *Klemm.* Rubber latex deserves consideration because it gives a paper high folding strength; but its high price limits its use. *Chemiker-Ztg.*, April 22, 1924, p. 253.

"Hygiene in the Manufacture and Handling of White Lead." *Rudolf Plaucln.* The only means of making sure that hygienic requirements are met is to provide for inspection of factories by unprejudiced physicians. Approved safety measures should be made compulsory. *Chemiker-Ztg.*, May 1, 1924, p. 278.

"Effect of Sodium Bisulphate on the Yield of Sodium Sulphide in the Fusion Process." *P. P. Budnikoff.* Use of $NaHSO_4$ instead of or mixed with Na_2SO_4 for making Na_2S has a deleterious effect on the furnace which is not compensated by the slight increase in yield. *Chemiker-Ztg.*, May 1, 1924, pp. 278-9.

"Adaptability of Firwood for Pulp and Cellulose." *Walter Freund.* Although firwood closely resembles pine, it is little used for making pulp and cellulose, on account of its coarser fiber. Pulp from fir is, however, quite suitable for certain purposes, notably cardboard, soda pulp and steamed mechanical wood (for leather board or brown pulp). *Chemiker-Ztg.*, May 1, 1924, pp. 279-80.

"Use of Antimony in the Enamel Industry." *Bruno Rewald.* Properly made glazes and frits containing antimony are perfectly safe for enamel ware, even for food containers. There is no justification for legal prohibition of the use of antimony in enamel ware. *Chemiker-Ztg.*, May 1, 1924, p. 280.

"A Furnace for Reactivation of Powdered Decolorizing Charcoal." Description of a furnace made by the Purit Co., Groningen. *Chemiker-Ztg.*, May 1, 1924, pp. 280-281.

"Explosion Due to Treating Trichlorethylene With Alcohol and Alkali." *Felix Fritz.* A case of spontaneous combustion of the distillate from a solution of trichloroethylene in alkaline alcohol. *Chemiker-Ztg.*, May 6, 1924, p. 293.

"Activin, a New Form of Active Chlorine." *Richard Feibelmann.* Sodium *p*-toluenechlorsulphamide [$CH_3.C_6H_4.SO_2.N(Cl)Na$] has been prepared under the name "Activin" for 19 years by the Chemische Fabrik Pyrgos (Radebeul, Dresden). It is known in England as Chloramine T, discovered by Chattaway in 1905. In addition to the well-known medical uses of Chloramine T, Activin is recommended for bleaching, for solubilizing starch (for which it is superior to enzyme preparations). Other uses are expected to develop. A byproduct is potassium *p*-toluenesulphamide, which is valuable as a weed and sod eradicator on account of its toxicity and low solubility. *Chemiker-Ztg.*, May 8, 1924, pp. 297-9.

"Gasification of Low-Grade Fuels and Recovery of Tar for Industrial Fuel and Generation of Power." *Hugo Dicke, Jr.* Lignites with as little as 1,700 to 1,800 heat units can be successfully gasified. The advantages and disadvantages of the Heller generator are discussed. *Chemiker-Ztg.*, May 8, pp. 299-300.

"Poisoning of Nickel Catalysts." *Friedrich Wolff.* An active catalyst (highly dispersed, large surface) is relatively less sensitive to poisons than a less active preparation (smaller surface). *J. praktische Chem.*, April, 1924, pp. 159-64.

"Solubility of $CaCO_3$ in Carbonated Water at High Pressures." *Otto Hachnel.* Solubility measurements and electrolytic studies at 56 atmospheres. *J. praktische Chem.*, April, 1924, pp. 165-76.

"Quinoline Dyes." *E. Rosenhauer.* Bromination of quinaldine bases and condensation of the products with phenylhydrazine, *p*-aminodiethyl aniline or their derivatives. *J. praktische Chem.*, April, 1924, pp. 232-40.

"Storage of Flammable Liquids." *Albert Neuberger.* Contrary to prevailing opinion in Germany, use of an inert gas under pressure is not the only means, nor even the best, for safe storing of flammable liquids. The use of Davy safety gauze and suitable treatment of the liquid to prevent formation of explosive mixtures with air are the best two safety measures. Both are utilized in the Schilde-Eickemeyer storage system. *Chemiker-Ztg.*, May 1, 1924, pp. 277-8.

"Simple Method of Calculating Pycnometric Data." *R. Saar.* Formulas and correction factors. *Chemiker-Ztg.*, May 3, 1924, pp. 285-6.

"Distribution of Water in Margarine." *J. Angerhausen* and *L. Stockert.* Can margarine be produced to conform with legal requirements as to water content? The question is answered in the affirmative. *Chem.-techn. Uebersicht*, May 3, 1924, p. 74.

"A New Kind of Feed Cake." A new feed cake from Scandinavia, costing about half as much as oil-cake, is made from fish offal and potatoes. *Chem.-techn. Uebersicht*, May 3, 1924, p. 74.

News of the Industry

Summary of the Week

Neither helium bill nor Muscle Shoals bill finally acted upon in closing sessions of Congress.

Second National Colloid Symposium to be held at Northwestern University, June 18 to 21.

House Committee on Mines holds hearing on potash bill, already passed by Senate.

Agitation over Ford's offer for Muscle Shoals has resulted in demand for cheaper fertilizer.

Manufacturing Chemists Association holds annual meeting at New York.

Sales of German potash salts have fallen off sharply in recent months.

Nitrite of soda may be included among the materials the use of which is permitted in preserving meats.

The Tariff Commission has ordered an investigation into production costs of important vegetable oils.

Investigation Into Costs of Vegetable Oils Ordered

The Tariff Commission has directed members of its staff to proceed with an investigation into costs of production of cottonseed oil, soya-bean oil, peanut oil and coconut oil under the terms of the flexible tariff and at the same time has ordered the Chemical Section to make a general survey of all other vegetable and animal and fish oils relative to substitution, as a result of which other oils may be added to the cost investigation.

This action is the result of an application for reduction in the duties on various oils filed by the Bureau of Raw Materials, representing soap and paint manufacturers. A preliminary hearing was held several months ago, at which farm organizations vigorously opposed the investigation on the ground that it would unsettle the market for the raw materials and make financing of the crops difficult.

Two crews from the commission's staff will take the field in the vegetable oil investigation before the end of June. C. H. Penning and Dr. Frank Rutter, of the Chemical Section, with E. M. Whitcomb, of the accounting staff, will go to the Far East investigating coconut oil and soya-bean oil principally. They will visit Manchuria, China and Japan. Some investigation into cottonseed oil will be made in China. R. H. Cragg, of the Chemical Section, and another chemist yet to be selected and Merryn Braun and A. T. Geraci, accountants, will leave for Europe and later will go to British India and Ceylon. They will investigate cottonseed oil, peanut oil and coconut oil.

The investigation of these commodities in domestic plants will not be started until after July 1, when the 1925 appropriation of the commission will become available.

The field investigation is expected to be concluded late in September or early in October.

Stone Interested in Work of Trade Associations

Attorney-General Stone is taking a deep personal interest in the whole subject of trade statistics and trade association activities. During a conference with a group of attorneys who are interested in trade association activities, he discussed the questions involved at length. He gave no indication as to any conclusions he may have formed on the subject, but indicated that he will make a careful study of the whole matter. Other conferences will be held.

Nitrite of Soda May Be Used in Preserving Meats

Experimentation in the use of nitrite of soda in curing pork products is being conducted on a large scale by the packing industry in co-operation with the Bureau of Animal Industry of the Department of Agriculture. While nitrite of soda has not yet been added to the substances that may be used legally in preserving meats, it is stated at the Bureau of Animal Industry that the experiments are showing very promising results.

If nitrite of soda can be substituted for the nitrate of soda in the curing of pork products, it will make possible an important economy by reducing the carrying charge. The quicker action on the part of sodium nitrite reduces the curing period 20 to 60 per cent. Taking a 14-lb. ham as a unit, the curing time is 75 days. Since literally millions of dollars always is tied up in pork products undergoing curing, it is apparent that large savings can be made in interest on the investment and by reducing the space and facilities necessary to conduct the curing operation.

Sodium nitrite has been used with indifferent success by German packers for many years. Research work on the part of the American packing industry brought the use of nitrite to a much more effective basis. Lately the Bureau of Animal Industry has been co-operating in this research work.

Cramton Bill Passes in House in Original Form

By a vote of 275 to 90 the Cramton bill was passed by the House on June 5. By the provisions of this measure the prohibition unit would be established as a bureau of prohibition in the Treasury Department.

The House Judiciary Committee in reporting the bill had changed the method of appointing the head for the proposed department of industrial alcohol by vesting the power of appointment in the Secretary of the Treasury instead of in the Prohibition Commissioner, as had been originally proposed. This change did not find favor with Representative Cramton and other proponents of the bill and it was thought that they would allow it to fail of passage at this session of Congress rather than secure the enactment of the bill in the form reported out by the committee.

The probability of the latter action was enhanced by a bill introduced on May 31 by Senator Sterling. It was identical in every particular with the bill reported by the Judiciary Committee of the House with the exception that the chief of the division of industrial alcohol and chemistry was to be appointed by the Prohibition Commissioner.

Contrary to expectations on Thursday, with the House operating with only one vote on a bill and two-thirds required for passage, Representative Cramton moved the passage of his bill, to which he added an amendment, bringing it back to its original form. The bill is expected to pass the Senate without much opposition.

Tar and Asphalt Specifications Being Prepared

The Bureau of Standards is issuing for the Federal Specifications Board a series of circulars giving government specifications for coal-tar and asphalt products used for roofing, waterproofing, etc. Some of the circulars thus far available deal with the following subjects: Coal-tar pitch for waterproofing, coal-tar pitch for roofing, surfacing materials for bituminous built-up roofing, asphalt for mineral-surfaced roofing, asphalt for waterproofing, and asphalt primer for roofing and waterproofing.

German Indigo Prominent in Chinese Markets

G. C. Howard, trade commissioner at Shanghai, reports that the Chinese indigo market has been demoralized during the past 2 months by the price-cutting campaign inaugurated by firms handling the German product. As a result of the sensational price reductions, Chinese dealers are curtailing purchases, apparently looking forward to still better values. The dullness of the market may also be accounted for by the extremely depressed condition of the yarn and cloth markets. Yarn cannot be spun profitably at present cotton prices, and there is talk of further curtailment on the part of local mills.

A review of the Chinese indigo imports for the month of February reveals the fact that Germany supplied more than half of the requirements. Approximately 12,500 piculs of the total imports of 23,605 piculs is believed to be of German manufacture. The statistics show that the United States brought in 5,018 piculs and was the second largest importer during that month. Receipts of indigo during the first 10 days in March amounted to 7,733 piculs, of which Germany furnished 6,188 and the United States 795 piculs.

Suggested That Patent Medicine Manufacture Be Increased

From an agency interested in the fostering and expansion of the domestic chemical industry comes the suggestion that the patent medicine industry, a large consumer of chemical products, could multiply its output many times were it to take systematic steps to improve its reputation and to rid itself of the relatively small output of spurious products. Patent medicines, it is pointed out, have suffered in the public esteem because of generations of opposition to them from physicians. The feeling within the medical profession, however, has undergone a marked change during the last decade. It now is recognized that the public has very definite and accurate knowledge of when and how to use medicine. The efficient physician is not anxious to devote his time to prescribing for minor ills when there is such demand for his services on the part of those having disabilities that really require them.

Experimental Plant Urged for Working Oil Shale

The President's commission which is studying the policies that best may be applied to the government's oil reserves has recommended, it is understood, the establishment of an experimental plant in the vicinity of naval oil shale reserve No. 1, in Colorado. The recommendation followed a hearing before Secretaries Wilbur, Hoover and Work. If an experimental plant is established, it would be operated under the technical supervision of the Bureau of Mines.

It was the opinion of those at the hearing that the day may not be as distant as some think when resort must be had to oil-shale resources for petroleum supplies. In view of the uncertainty of the petroleum supply in the face of the country's ever-mounting consumption, it appeared to be the unanimous opinion of the representatives of the government present that experimental work on oil-shale utilization should begin at the earliest time possible.

German Potash Sales Declined Sharply in May

Recent reports from Essen say that the situation in the German potash industry has become still worse. Sales during the first quarter of the year totaled 1,108,453 doppelzentner of K_2O, compared with 2,307,220 for the same period last year. The figures for April were 560,674 doppelzentner and the Kalisyndikat reckons the total May sales at only 126,500. The spring sales not having cleared out stocks at the works as in previous years, the industry approaches the slow-selling summer months with large supplies on hand. The credits granted to agriculturists have not had the intended effect, as farmers have only partly departed from their reserved attitude. Even the largest concerns can keep their works going only by means of large credits and then only to a very reduced extent, and there is no doubt that within a very short time further considerable reductions of staff must take place and many works suspend activity altogether.

Regarding prospects for autumn business nothing can be predicted at present. A revival in business can occur only when the agricultural concerns again work more satisfactorily and the foreign political pressure on Germany is removed.

Alabama Cement Plants Operating at Top Speed

All cement plants in Alabama are operating at maximum capacity, with orders ahead to insure this basis of production for some time to come. The Lehigh Portland Cement Co. is setting up its fourth kiln and unit at the new works in the vicinity of Birmingham and plans to place the extension in operation at the earliest possible date. The Atlas Portland Cement Co. is active at its Leeds Works, near Birmingham, and will soon complete a new bag factory there. Each of these mills has a rated output of close to 1,500,000 bbl. per annum.

Helium Legislation Postponed

Prospects for the passage of the helium bill, as this is written, seem practically to have disappeared. The Senate Committee on Mines and Mining during its consideration of the proposed legislation raised doubt as to certain legal technicalities on which no agreement could be reached. Several members of the committee were of the opinion that it would be better to make haste slowly rather than launch the government in an enterprise which might make it liable for large claims from leasors.

Federal Trade Complaints

Misleading brand names alleged to be used in connection with substitutes for turpentine and linseed oil is the basis of a complaint issued by the Federal Trade Commission against the Waverly Oil Works Co., of Pittsburgh, Pa. The complaint alleges that the concern markets substitutes for turpentine and linseed oil under the brand names of "Tur-min-tine" and "Min-seed-oil." Each of the products, the complaint states, is a distillate of petroleum. It is alleged that "Tur-min-tine" contains no turpentine, and "Min-seed-oil" contains no linseed oil.

The U. S. Oil Co., of Providence, R. I., also is cited for alleged unfair methods of competition in the marketing of textile oils and allied commodities.

According to the citation, the respondent manufactures textile oils and allied commodities and in the sale thereof, it is alleged, has offered and given sums of money to employees of the purchasers of the oil company's products without the knowledge and consent of the employers. Such sums of money are given as inducements to recommend respondents' commodities to their employers in preference to competitors' products.

Oil Refineries Increase Output in April

Petroleum refiners in this country established in April a new monthly record for production of gasoline. The output amounted to 754,773,232 gal., the Department of the Interior has announced. This surpasses by more than 11,000,000 gal. the high record production mark made in March, which had in turn passed by 48,000,000 gal. the previous high record set in January. Largest stocks of gasoline in the country's history were on hand at refineries May 1, when the supply totaled 1,607,786,404 gal. This figure represents an increase of 36,381,737 gal. since April 1, when a new high mark had been recorded.

During April the department received reports from 261 operating refineries, with an aggregate daily crude oil capacity of 2,166,332 bbl., running to stills a daily average of 1,841,617 bbl. of both foreign and domestic crude oil, or 85 per cent of their daily operating capacity. This represents an increase of 5.3 per cent over the refinery operations of the country during the previous month.

Washington News

House Mines Committee Holds Hearing on Potash

A hearing on the bill passed by the Senate to direct the Geological Survey to investigate possible deposits of potash in the United States and the Bureau of Soils of the Department of Agriculture to continue its research into improved methods of recovery of byproduct potash from cement, blast-furnace and other industrial plants was held June 2 by the House Committee on Mines and Mining. Witnesses were asked to extend their remarks for the printed hearings. The committee will report the bill favorably and action will be taken in the House at the December session of Congress.

Witnesses before the House committee covered in brief the same ground that was laid before the Senate Committee on Agriculture on this measure. The principal witnesses were Dr. George Otis Smith, director of the Geological Survey; Dr. George R. Mansfield, of the Survey, and Dr. J. W. Turrentine, in charge of potash investigations for the Bureau of Soils.

The possibilities of increasing the recovery of byproduct potash were stated as promising by Dr. Turrentine. Dr. Smith and Dr. Mansfield declared that while it is believed a rich bed of potash exists in the Southwestern section of the country, notably under several counties in Texas, it will require extended borings to determine just what conditions obtain. All witnesses stressed the necessity of developing potash supplies in the United States to relieve the country from foreign control of this essential fertilizer element, which is used widely in a number of industries also.

The bill would authorize an appropriation of $500,000 a year for 5 years for research work by the Geological Survey and $50,000 a year for 5 years for the Bureau of Soils.

Survey of Commercial Situation in Paint Industry

A survey of the commercial situation in the paint industry is being undertaken by the Chemical Division of the Department of Commerce. An unusual situation exists in this industry in that domestic production of many paints, oils and varnishes cannot keep pace with the increase in the demand. This is believed to be one result of the industry's advertising campaign. "Save the surface and you save all" has created such a demand for paint that, speaking generally, the industry could not expand at the same rate at which consumption is increasing. This explains the relatively large imports of many paints and varnishes.

While it is realized that demand has been particularly heavy since the war because the large amount of building, there is reason to believe that the demand for paint will not follow the curve of building as it begins to flatten out.

The Chemical Division survey, however, will deal only incidentally with the ability of the industry to increase its capacity. Its main objectives are to develop more definite facts as to the problems of cancellation of orders, sales policies and distribution in general. The survey is under the immediate direction of G. H. Priest, recently added to the staff of the Chemical Division as head of its paint and varnish section.

Cheap Fertilizer Demand Grows From Muscle Shoals Agitation

Much emphasis has been given the demand for cheaper fertilizer by the discussion of the Muscle Shoals project in Congress. This has led to renewed discussion of the possibilities of eliminating waste in the transportation and use of fertilizers.

Those who would see Muscle Shoals go to Henry Ford claim that Mr. Ford's fertilizer operations would reduce the spread between the cost of the raw materials that enter into mixed fertilizers and the delivered cost of the product. Many who are opposed to the Ford proposition agree that this spread is too great, but it is their opinion that the fertilizer industry is thoroughly capable of eliminating any unnecessary wastes that may exist. It is their hope to lease the Muscle Shoals plants to private interests that will concentrate on that problem. In this connection it is pointed out that the Department of Commerce has co-operated effectively with other industries in campaigns looking to simplification and the elimination of waste, and doubtless can render similarly effective service to the fertilizer industry.

With the increased number of co-operative associations among farmers and in view of their increasing efficiency and financial strength, the problem of reducing waste in the transportation of fertilizers has become much simpler. Most of these co-operative associations are in a position to arrange the mixing of the fertilizers at points near where they are to be used. This eliminates the transportation of inert material. The point also is made that waste will be avoided by dealing with the co-operative associations from the fact that they have accurate knowledge as to the proportions of the various fertilizer materials that are best adapted to localities. Where purchases are made by the individual farmer, he frequently buys a fertilizer not thoroughly adapted to his particular soil needs.

Muscle Shoals Bills Shelved Till Next Session

Senator Underwood last week made known the temporary disposition of the much-mooted question of the Ford Muscle Shoals bill when he announced that the Ford champions had agreed to let the matter rest for the remainder of the session ending Saturday in return for a preferred position for it on the calendar next session. Unanimous consent was then given to placing the subject matter under the head of unfinished business when Congress resumes on Dec. 3.

Production of Acetate of Lime and Methanol Declines

A better movement of acetate of lime in April is indicated by reports received by the Department of Commerce. According to these reports production in April was reduced materially from the total for March and as shipments from plants were larger, there was a decline in stocks on hand. The output of methanol also was lessened in April and stocks were reduced. The following figures give production, shipments and stocks:

	Acetate of Lime (in Lb.)		
	Production	Shipments (or Use)	Stocks, End of Month
Jan.	13,420,193	9,022,250	23,401,511
Feb.	13,172,610	8,548,032	27,622,967
March	14,107,411	9,027,539	32,370,329
April	12,650,393	12,002,295	30,534,533

	Methanol (in Gal.)		
	Production	Shipments (or Use)	Stocks, End of Month
Jan.	705,747	642,812	2,632,633
Feb.	689,503	681,057	2,738,308
March	741,505	617,949	2,749,818
April	673,746	602,457	2,656,211

British Sulphate of Ammonia in Far East Markets

Information just has come to official quarters to the effect that certain American exporting companies are filling their orders for ammonium sulphate in the Far East with supplies obtained in Great Britain. Inquiry has developed the fact that this course was pursued only after it had been conclusively determined that there was no hope of securing the American product at or near the prices the British were willing to make. There is a tendency in official quarters to criticise the policy of the producers of ammonium sulphate, who seemed disinclined to shade their prices even when their product is a drug on the market. If there is a surplus of ammonium sulphate with the steel industry operating at less than 50 per cent capacity, there is a feeling that there should be enough foresight to assist in the building up of markets abroad to take care of the larger production which will come with increased operation of the steel mills.

Since ammonium sulphate is a by-product, there is a feeling that it could be sold at prices that would help American exporters. Until recently the United States has occupied what was clearly a dominant position in Far Eastern markets. That dominance, however, is being threatened at present by the very remarkable come-back of the British. The exporting companies are having their difficulties multiplied unnecessarily, they contend, by their inability to secure co-operation from the producers of certain commodities.

News in Brief

Texas Sugar Refinery Opens — The Texas Sugar Refining Co., Texas City, Tex., has started production at its new local refinery, in course of building for about a year past, and purposes to advance operations until maximum output is reached, or about 1,000,000 lb. per day. The current schedule is on a basis of 500,000 lb. daily. Sugar cane from Cuba is being used at the mill, and regular cargoes are to be continued for an indefinite period. The present working force will be increased in the near future.

Another Manitoba Pulp Plant Planned —Negotiations are proceeding with respect to the construction of a $5,000,000 paper plant at Pine Falls, Man., by J. D. McArthur & Co. The plant site is situated 3 miles from Pine Falls. The original plans were altered to increase the daily capacity to 200 tons. The whole project was temporarily held up until railway facilities were assured. With the recent announcement that a branch line would be built from East Selkirk to Pine Falls, this difficulty has been overcome.

French Ceramic Congress Discusses Many Topics — At the technical congress of the French ceramic industry, being held this month at Paris, several important topics are to be discussed. These include operation of continuous kilns, determination of kiln temperature, baking costs with forced versus natural draft, chimneys versus mechanical ventilators, oil versus coal as a fuel, modern processes of artificial baking and drying, and methods of control in drying plastic materials.

Canadian Company to Deal in Many Fuels — The Chemical Charcoal Co., Ltd., has been incorporated in Canada with a capitalization of $500,000 to deal in coke, coal, peat, oil, wood and fuel of all kinds. The principal incorporators are L. E. Duclos, of Westmount, Que., and J. G. Avard, of Montreal. Headquarters of the company will be in Montreal.

Hawaiian Sugar Concern Doubles Plant—The Central Bacolod, Honolulu, Hawaii, is perfecting plans for doubling the capacity of its sugar mill in this section, and has recently awarded contracts for a portion of the work to the Honolulu Iron Works, totaling about $800,000. Practicaliy all of the equipment will be produced at the local plant of the iron works company. The new extension will consist of twelve rolls, crusher and auxiliary equipment, and will approximate $1,000,000, complete. The existing plant was constructed in 1920.

Americans Interested in Canadian Salt—It is reported from Regina, Sask., that a syndicate of American capitalists has taken up an option on the sodium sulphate "lake" at Alsask, Sask. If the sodium sulphate is as pure as the reports indicate, development work will be started early in 1925.

Second Colloid Symposium to Be Held June 18-21

The program for the Second National Colloid Symposium to he held at Northwestern University, Evanston, Ill., June 18 to 21, indicates that this year, as last, the scope of the meeting will be broad. Its speakers will represent many sections of the scientific world. Demonstrations of equipment interesting to the colloid chemist have been arranged and include the Premier mill, the Sharples supercentrifuge and the Dutcher mill.

In accordance with the high standards established for the material to be presented papers are to be given on invitation only and 40 minutes is to be available for each address. The symposium is to open officially on Wednesday afternoon, June 18, when Professors W. Lee Lewis and Henry N. Holmes will deliver addresses of welcome. Following this four papers are scheduled: "General Principles of Ion Effects on Colloids," by Prof. L. Michaelis, of Aichi University, Japan, formerly of the University of Berlin; "The So-Called Electro-Viscous Effect in Rubber Sols," by G. S. Whitby, of McGill University; "Determination of the Size of Particles and Their Distribution," by W. J. Kelly, of the Goodyear Rubber Co., and "The Study of Grain Size and Grain Distribution by an Improved Method of Sedimentation," by V. B. Sease and F. F. Renwick, of E. I. du Pont de Nemours & Co.

Thursday morning nine more papers will be given, including "The Effect of Hydrogen-Ion Concentration on Clay Suspensions," by F. P. Hall, of Massachusetts Institute of Technology; "Properties of Clays," by A. V. Bleininger, of the Homer-Laughlin China Co., Newell, W. Va.; "Bentonite and Other Colloidal Clays," by Jerome Alexander, of New York, and "Fluidity and Plasticity in Colloid Control," by E. C. Bingham, of Lafayette College.

In the afternoon, in addition to demonstrations of equipment, Neil E. Gordon, University of Maryland, will speak on "Soil Gels and the Theory of Adsorption," and George Bouyoucos, of Michigan Agricultural College, will discuss "Soil Moisture."

Following the meetings during the day Friday a joint meeting with the Chicago Section of the A.C.S. will be held at the Chicago City Club in the evening, when W. D. Harkins, University of Chicago, will discuss Isotopes. The papers of the day include "Oriented Adsorption," by W. D. Harkins, of the University of Chicago; "Emulsions," by Harry N. Holmes, of Oberlin College; "The Effect of Surface Energy on Colloidal Equilibrium," by R. G. Green and H. O. Halvorson, of the Medical School of the University of Minnesota; "Bacteria as Colloids," by Arthur I. Kendall, of the Medical School of Northwestern University: "Some Aspects of Acid and Alkali Binding by Proteins," by Ross A. Gortner, of the University of Minnesota, and "The Effect of Ammonium Salts Upon the Swelling of Colloids and Upon the Growth of Yeast," by Ellis I. Fulmer, of Iowa State College.

On Saturday morning the symposium will end with three more papers: "An Unexplained Lubrication Phenomenon," a note communicated by W. B. Hardy, of the Royal Society, London; "Sols With Non-Spherical Particles," a paper communicated by Herbert Freundlich of the University of Berlin and "Brownian Movement in Gels," (with movie demonstration) by E. O. Kraemer, of the University of Wisconsin.

All chemists desiring to attend this symposium and wishing to lodge in Evanston may make arrangements through the Department of Chemistry of Northwestern University.

Many Engineers Elected to French Parliament

The recent French elections have brought into the new French Parliament, which holds over until 1928, various engineering personalities in a larger proportion than ever before, which points to the fact that the day of the lawyer as a legislator, the day of the professional politician, is waning in France.

Included in the list are Louis Nicole, a well-known textile expert, and M. Laroche-Joubert, a paper manufacturer. Among the civil engineers are M. Le Troquuer, at present Minister of Public Works, and MM. Accambray, Margaine, Baron, Plichon, Serot, Bazile and Jean Carnot, son of a former President of the republic, and Joseph Paganon, director of the vast Etablissements Grammont, whose activities run from cement to caoutchouc.

Three economists of varying tendencies are elected. These are Andre Francois Poncet, of the university faculty and author of "The 8-Hour Law in France" and "France and the Reparations Problem," administrator of the Société d'Etudes et d'Informations Economiques; Pierre Nogaro, professor of the law faculty of the University of Paris and author of an important work on the customs régime, and Etienne Antonelli, professor of the law faculty of the Lyon University and author of "Les Actions de Travail."

Other specialists are Lesache (potash), Barthe (carburant national), Leboucq (synthetic ammonias), Lamoreaux (mines and petrols), Plaisant (industrial property) and Varenne and Sibille (public works).

Princeton to Have New Chemical Laboratory

The board of trustees of Princeton University has approved tentative architectural plans by Day & Klauder, Franklin Bank Bldg., Philadelphia, Pa., for the proposed new chemical laboratory, and finished plans will be made at once. The project will cost about $2,000,000, including endowment, and while this sum is not yet available, it is expected that all financial features can be taken care of at an early date. The new laboratory will be among the finest structures of its kind in the country. Dr. Lauder W. Jones is chairman of the department of chemistry.

Financial

George W. Davison, chairman of the committee representing the $25,000,000 first mortgage 7 per cent bonds of the Virginia-Carolina Chemical Co., has confirmed reports that the committee had started foreclosure proceedings to protect its interests. This action follows the failure of the receivers to provide funds to meet the June 1 interest and was looked upon as a preliminary to the reorganization of the company, which was placed in the hands of receivers on March 3.

The National Lead Co. will have about a 4 per cent interest in the £6,250,000 capitalization of the new tin-mining company which is merging the interests of Simon Patino and Chilean Tin Co. in an organization that will own about 80 per cent or more of the tin production of Bolivia.

The American Cyanamid Co. has declared an extra dividend of 50c. a share on common and regular quarterly dividend of $1, also regular quarterly dividend of 1¾ per cent on the preferred.

The St. Joseph Lead Co. has declared a dividend of 50c. a share. In the preceding quarter dividends included 25c. per share regular and 25c. per share extra.

Sales of Feldspar Increased in 1923

The U. S. Geological Survey has estimated from reports received directly from the producers that the crude feldspar sold in the United States in 1923 amounted to 140,700 long tons, valued at $1,035,000, or $7.36 a ton. These figures show an increase of 20 per cent in quantity and 23 per cent in value as compared with 1922. North Carolina was the leading state, reporting 40 per cent of the quantity sold; Maine was second, with 18 per cent; and New Hampshire was third, with 15 per cent.

The average price per long ton in North Carolina was $6.34; in Maine it was $9.20; and in New Hampshire it was $7.48. Feldspar is used principally in the manufacture of high-grade pottery, enameling, and scouring soap. Small quantities of specially selected feldspar are used in making artificial teeth.

The sales by states in 1922 and 1923 are shown in the following table:

	1922		1923 *a*	
State	Long Tons	Value *b*	Long Tons	Value *b*
California	2,378	$17,510	9,700	$65,000
Colorado	104	580	(*c*)	(*c*)
Connecticut	7,499	47,887	8,800	76,000
Maine	21,692	221,478	25,000	230,000
Maryland	2,899	18,099	2,700	16,000
New Hampshire	14,017	116,751	21,000	157,000
New York	(*c*)	(*c*)	15,000	127,000
North Carolina	56,043	333,745	56,000	355,000
Pennsylvania	(*c*)	(*c*)	2,000	6,000
Virginia	(*c*)	(*c*)	(*c*)	(*c*)
Undistributed	12,495	88,518	500	3,000
	117,127	$844,568	140,700	$1,035,000

a Figures for 1923 are preliminary and subject to revision.
b Value at mine or nearest shipping point.
c Included under "Undistributed."

California Electrochemists Discuss Rotary Kiln for Making Iron

At the first meeting of the newly organized California Section of the American Electrochemical Society, held at the Mining Building, University of California, Berkeley, on May 24, Oliver C. Ralston described the rotary-kiln furnace for the manufacture of sponge iron, developed by C. E. Williams and E. F. Barrett at the Seattle station of the U. S. Bureau of Mines. The kiln is fired by oil. The iron ore, crushed to 8 mesh, is mixed with coal in the proportion of 100 to 75 by weight, the mixture passing down through the narrow portion of the kiln, where it is preheated, to the oxidizing zone, where metallic iron is produced. Operation is continuous. The residual coke, siliceous material and metal are discharged through an opening in the periphery of the oxidizing zone at each revolution of the kiln, cooled and passed over a magnetic separator for the isolation of the sponge, which is melted in an electric furnace.

In the discussion that followed, A. W. Allen outlined the results in Sweden obtained by the use of the Soderberg self-baking electrode in the manufacture of iron in the electric furnace. A recent modification of this idea involves the use of iron ore mixed with pitch or tar for the manufacture of the electrodes. The papers on the electrolytic refining of tin and the production of electrolytic copper, presented at the meeting of the society recently held at Philadelphia, were also discussed.

Red Oxide Plant for Australia

A report to the Department of Commerce says that a company has been recently established in Melbourne, Australia, with leases on lands near Point Addis, Victoria. The principal product will be red oxide pigment, with sulphate of potash as a byproduct, and if a satisfactory market can be secured, sulphuric acid will also be manufactured. The treatment of the crude, consisting chiefly in roasting and washing, presents no technical difficulties, and the oxide obtained has been pronounced of excellent quality by pigment experts. It can be produced of a uniform grade, thus overcoming objections raised against oxides from other sources.

U. S. Industrial Chemical Co. to Open New Plant

The United States Industrial Chemical Co., Baltimore, Md., a subsidiary of the United States Industrial Alcohol Co., has work nearing completion on the new addition to its local plant in the Curtis Bay section, and plans to place the unit in service early in July. The extension will be used primarily for the production of potash, ammonium sulphate and other affiliated chemicals, and byproducts from molasses waste, and is expected to develop an extensive capacity. The construction and machinery installation has been in progress for some months, following an announcement of the intention of the company to develop a fertilizer branch of manufacture.

Trade Notes

Adrian D. Joyce, president of the Glidden Co., of Cleveland, was in New York last week.

Victor Blagden, of Victor Blagden & Co., London, England, is expected to arrive in New York in about a week.

At a meeting held last Tuesday directors of the Marden-Wild Corporation elected P. F. Wild to the presidency of the corporation and F. M. Chapman was made treasurer.

William J. Follett, senior member of Follett & Co., Boston, Mass., who had been identified with the wool business for more than 40 years, died on June 3, at his home in Newton, Mass.

C. F. Beatty, of the New Jersey Zinc Co., is in England and will not return to this country until the end of the month.

John A. Keefe, formerly manager of the Philadelphia office of Spencer, Kellogg & Sons, has succeeded F. A. Anderson as manager of the New York office of the company.

Celite Installs Immense Kiln

An unusually long kiln, for the calcining of diatomite, was recently shipped to the Celite Products Co., Lompoc, Calif., after manufacture and assembly at the plant of the Llewellyn Iron Works, Los Angeles. It was 125 ft. long by 9 ft. diameter, of ¾-in. plate, and was transported on two railroad cars, with a spacer in between. A running schedule of only 8 miles per hour was arranged, to obviate accident as a result of the length of the load and to prevent overheating of the car bearings. The total weight, exclusive of caboose and locomotive, was more than half a million pounds, the kiln itself weighing 101 tons.

War Minerals Relief Act Figures in Court Cases

The Supreme Court has granted a motion to advance the appeal of the Secretary of the Interior in the suit instituted by the Chestatee Pyrites & Chemical Corporation and has set the case for argument Nov. 10 at the same time as the appeal of the Secretary in the case instituted by Logan Rives.

Both cases involve the war minerals relief act and are appeals from decisions adverse to the Secretary entered by the District of Columbia Court of Appeals. In the Chestatee case, the Secretary declined to allow a clam for interest on borrowed money the principal of which was used to operate a war mineral operation. The Rives case involves money lost on the purchase price of mineral-bearing lands. Two questions of major importance are involved in these cases: whether the courts may intervene in view of that section of the war minerals relief act which stipulates that the adjustment of the Secretary of the Interior shall be "conclusive and final," and, secondly, whether these cases are not suits against the United States without its consent.

Men You Should Know About

Dr. R. P. ANDERSON, gas expert, formerly connected with the United Natural Gas Co., Oil City, Pa., has been appointed technologist for the American Petroleum Institute, effective June 1, succeeding Van H. Manning, recently resigned.

WILLIAM C. BURTON, treasurer of the Surpass Leather Co., Philadelphia, Pa., has returned to his desk following an absence of several months in Europe.

BURTON T. BUSH has been elected chairman of the Fine Organic Chemical Section and becomes ex-officio a vice-president of the Synthetic Organic Chemical Manufacturers Association, and not "president" of the association as mentioned in this column in our issue for May 26.

Dr. H. W. DAHLBERG, research manager of the Great Western Sugar Co., Denver, Colo., returned May 30 on the "George Washington" from a 3 months trip to Germany, Czechoslovakia, Italy and France, where he studied conditions in the beet sugar industry.

J. V. E. DICKSON, research chemist of the research department laboratory of The Barrett Co., New York City, has recently resigned to accept a position with Weiss & Downs, of New York City.

PHILIP T. DODGE has resigned as president of the International Paper Co., New York, to become chairman of the board of directors, a newly created office. He will be succeeded as president by R. A. GRAUSTEIN, a Boston attorney.

The engagement is announced of J. V. N. DORR, president of the Dorr Co., and Mrs. ELLEN M. SWIFT.

M. H. MCGAFFIGAN, heretofore chemist at the plant of the Wolverine Portland Cement Co, Quincy, Mich., is now chief chemist at the Michigan State Industrial Cement plant at Chelsea.

R. WALTER LEIGH, president of the American Beet Sugar Co., New York, has left the city for a tour of inspection of the different plants of the company in the West with a view to expansion and development.

D. S. MCAFEE, of the Dorr Co., left on June 2 for Los Angeles and will probably be on the coast for 6 or 8 weeks.

The engagement is announced of Dr. R. B. MOORE, general manager of the Dorr Co., and Miss GEORGIE ELIZABETH DOWELL, of Dallas, Tex. The wedding will take place at Dallas on June 18.

RICHARD RIMBACH, formerly assistant finishing end foreman of the rolling mill department of the Jones & Laughlin Steel Corporation, Pittsburgh, Pa., is now research engineer in the research department of the Union Switch & Signal Co, Swissvale, Pa.

JOHN S. TAYLOR, head instructor of forge production and heat-treatment of steel at the Carnegie Institute of Technology, Pittsburgh, Pa., and connected with the teaching staff of the institution for the past 18 years, has resigned to become ordained for the ministry. He will take the pulpit at the Trinity Episcopal Church at Rochester, Pa., on July 1.

H. F. WHITTAKER, formerly of the National Research Council, is now chemical engineer for the du Pont Cellophane Co., near Buffalo, N. Y., in charge of research and development work.

Obituary

JOSEPH R. JACKSON, SR., one of the pioneers in the steel industry, died at Brookline, Mass., May 31, in his eighty-seventh year. For a number of years he was a leading official of the National Tube Works, Pittsburgh, Pa., and retired from active business about 30 years ago.

JOHN F. KEHOE, of Newark, N. J., retired president of the Lister Agricultural Chemical Co. of that city, died at the St. Michael's Hospital, May 27, following a paralytic stroke. He had been a patient at the institution for more than 2 years. At an early age he became connected with the Lister Brothers chemical works and advanced from a minor position to that of general manager. In 1900, upon the reorganization of the concern under the name first noted, he was elected president and general manager, in which position he remained until his retirement in 1920, after 52 years of continuous service. He was one of the organizers of the American Agricultural Chemical Co., in 1900, and until his retirement was a member of the executive board of that company. His age was rather an open question, although it is said that he was between 75 and 80 at the time of his death. He was a bachelor and is survived by two sisters.

JOHN EMORY MEEK, vice-president and director of Johns-Manville, Inc., New York, died suddenly on May 25 at a hotel at White Sulphur Springs, Va., where he had been staying for about 2 weeks. He had been connected with the company for the past 30 years. Mr. Meek is survived by his wife, a brother and three sisters.

EDWIN R. REDHEAD, of Fulton, N. Y., president of the Victoria Paper Mills Co., which he was instrumental in organizing in 1880, died on May 30 at Syracuse, N. Y., aged 73 years. Mr. Redhead was prominent in the paper industry and was a trustee of Syracuse University.

FRANK F. SKINNER, of Everett, Mass., died on May 25. Thirty-eight years ago he was employed by the Cochrane Chemical Co. as a laboratory assistant and during the next 25 years worked in various capacities, being finally promoted to assistant to the president of the Western department. In 1911 he was transferred to the Boston office for work in the sales department. In 1917, when the Merrimac Chemical Co. bought the plant of the Cochrane Chemical Co., Mr. Skinner remained in his position as salesman, and in 1923 was promoted to assistant sales manager. In 1898 he married Nellie MacKnown, of Boothbay Harbor, Me., who survives him.

Calendar

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, Curtis Hotel, Minneapolis, Minn., June 9 to 14.

AMERICAN CERAMIC SOCIETY, summer meeting and tour, July 21 to Aug. 18.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN ENGINEERING STANDARDS COMMITTEE, executive meeting, New York, July 12.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN LEATHER CHEMISTS ASSOCIATION, Spring Lake, N. J., June 18 to 20.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

COLLOID SYMPOSIUM, second national, Northwestern University, Evanston, Ill., June 18 to 21.

INSECTICIDE AND DISINFECTANT MANUFACTURERS ASSOCIATION, Montreal, Canada, June 30 to July 1.

NATIONAL FERTILIZER ASSOCIATION, Kenilworth Inn, Asheville, N. C., June 9 to 14.

NATIONAL SAFETY COUNCIL, thirteenth annual congress, Louisville, Ky., Sept. 29 to Oct. 3.

NEW JERSEY CLAY WORKERS ASSOCIATION AND EASTERN SECTION AMERICAN CERAMIC SOCIETY, summer meeting, Trenton, N. J., June 20.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, Boulder, Colo., June 25 to 26.

WORLD POWER CONFERENCE, London, June 30 to July 12.

Margarine Makers to Meet

The Institute of Margarine Manufacturers announces the program for its fifth annual convention at the Ritz-Carlton Hotel in Atlantic City, June 12, 13 and 14, to include addresses by Dr. H. W. Wiley, director of the bureau of foods, in *Good Housekeeping;* Captain D. S. Bliss, U. S. Bureau of Internal Revenue; Dr. Robert H. Kerr, U. S. Bureau of Animal Industry; Louis N. Geldert, Interstate Cotton Seed Crushers Association; Dr. C. A. Browne, chief of the U. S. Bureau of Chemistry; Dr. W. D. Richardson, Swift & Co.; J. J. Wilke, Wilson & Co.; T. H. Eckerson, Eckerson Co.; B. S. Pearsall, Elgin, Ill.; Allan P. Ames, Ames & Norr, Inc., and Secretary J. S. Abbott of the Institute.

Fuels Section to Be Headed by Haslam at Ithaca

The officers of the American Chemical Society have authorized another meeting of the Gas and Fuel Section of the society in Ithaca next September. Prof. R. T. Haslam, of the Massachusetts Institute of Technology, has been appointed chairman and O. O. Malleis, of the research laboratory of the Koppers Co., Pittsburgh, will serve as secretary for that meeting.

Market Conditions

Improvement Reported in Demand for Chemicals for Prompt Shipment

Consumers Show Very Little Interest in Future Requirements—Firmer Market for Allied Products Advances Weighted Index Number

DIFFERENT consumers have been in the market for June requirements and call for additional lots has been more manifest. Round lot trading has not been conspicuous and for the most part buyers have confined operations to nearby requirements. With manufacturing industries going ahead on reduced schedules it is inevitable that requirements for raw materials should show a corresponding inactivity. It is also pointed out that contracting for current year needs was common in the latter part of last year and this tends to limit large lot buying at present.

The weighted index number for the week advanced to 152.27, which compares with 151.24 for the preceding week. Higher prices for cottonseed oil and other allied products were responsible for the higher average price level. Price changes in the strictly chemical list during the week were infrequent and unimportant. It can scarcely be said that any turn toward higher prices is indicated. In fact the movement of chemicals against contracts has lost some headway and resale offerings are frequent enough to create a feeling of unsettlement.

In our reports of last week it was stated that an expansion was looked for in the distribution of nitrite of soda. Greater credence was given to this report in the past week, because of advices from Washington to the effect that meat packers were working in conjunction with the Bureau of Animal Industry in developing methods for the use of nitrite in preserving meats. If these attempts prove successful, it is held that nitrite of soda will be given preference over refined nitrate of soda and may have some effect on consumption of nitrate of potash.

The most important tariff development of the week consisted in a decision of the Tariff Commission to proceed with an investigation into costs of production of cottonseed oil and of other vegetable oils both of foreign and domestic origin.

Acids

Most of the acids of the mineral group have held an easy tone. It is reported that Southern producers of the lower grades of sulphuric acid have surplus stocks which had been intended for fertilizer manufacture and that these stocks are being offered at very low prices in order to move them from works. Stocks in most producers' possession are large and the market in all centers is irregular. Acetic acid is in plentiful supply with buying moderate. Tartaric and citric acids have been moving freely but offerings are large enough to bring out some selling pressure. Oxalic has not turned for the better and the fact that imported offerings are free is intensified by the keen competition which exists among domestic producers. That domestic production has been curtailed has had no effect on values.

Potashes

Bichromate of Potash — Conditions are described as seasonably quiet with a scattered call for small lots. The tone has been easy with some sellers apparently eager to take on business at 9¼c. per lb. The open quotation is 9¼@9½c. per lb., according to seller and quantity.

Caustic Soda Sells More Freely for Export—Copper Sulphate Easier—Arsenic Demand Remains Slow—Larger Consumption Predicted for Nitrite of Soda—Caustic Potash Steady—Output of Bleaching Powder Restricted — Spot Nitrate of Soda Firm.

Carbonate of Potash—Imports of carbonate of potash in April were 652,271 lb., which compares with 834,368 lb. in April last year. Buying has been regular enough to keep stocks at relatively low levels and with firm markets reported abroad the market is reported to be basically sound. Prices are 5½@6c. per lb. for calcined 80-85 per cent and 5¾@6c. per lb. for hydrated.

Caustic Potash—Low priced stocks have been pretty well absorbed and the general quotation is 6¾c. per lb., for spot material. Forward positions were practically on a par with the spot market, as cables quoted 6.80c. per lb. as an inside figure for shipment from abroad.

Permanganate of Potash—Buying interest has been quiet and holders of spot material have shown more of an inclination to take the initiative. There was no difficulty in finding sellers at 14c. per lb. This price was possible on both foreign and domestic grades. An easier tone also was indicated for shipments and later deliveries were quoted fractionally under the spot price.

Prussiate of Potash—While buyers are taking only limited amounts, the market is holding a steady position and sellers are not willing to do better than 18½c. per lb. on spot transactions in yellow prussiate. Foreign markets, likewise, are holding firm and shipments cannot be secured at any concession from the spot quotation. Red prussiate is dull but appears to be more firmly held with asking prices at 35@37c. per lb.

Sodas

Soda Ash—The slower position of consuming trades has been reflected in the movement of ash from producing centers. In some cases deliveries have been postponed at buyers' request, but there still is a fair withdrawal against old orders. Prices are holding steady both for large and small lots. Contracts of light ash are offered at $1.25 per 100 lb. carlots, in bulk; $1.38 per 100 lb. in bags; and $1.63 per 100 lb. in bbl., these prices being f.o.b. works. Exports in April were 2,132,040 lb. as against 1,812,275 lb. in April last year.

Caustic Soda—Improvement in export buying has been reported in numerous directions. While some of this business is said to have been for small lots, the increase in export inquiry has given a steadier tone to values. Prices asked on a basis f.a.s. New York still show a range according to seller and are repeated at 2.90c. to 3.05c. per lb. Buying for domestic account remains light and there has been a slowing up in the movement of contract deliveries. Jobbing trade is of moderate proportions but prices are reported to be on a steady plane in all Eastern markets, though price cutting is said to exist in the West.

Nitrate of Soda—That consumption of nitrate in this country has failed to come up to earlier expectations is shown in a report from Chile which states that sales for the nitrate year ending June 30 will fall about 10 per cent below the estimates of 2,500,000 tons. Cable advices under date of May 25 stated that sales of nitrate for the 1924-25 nitrate year opened on May 14 and at the time of the cable had reached a total of 1,045,000 tons. Exports from Chile in April were 144,300 tons and imports into this country in April were 73,219 tons. Spot holdings of nitrate are small and the asking price is kept at $2.60 per 100 lb. but on later deliveries as low as $2.35 per 100 lb. is heard.

Nitrite of Soda — A report from Washington states that experimental work carried on by the Bureau of Animal Industry may result in the use of nitrite of soda in preserving meats. Rumors of this have been current in the trade and it is held that a broad

outlet for nitrite will be opened up. Demand for nitrite in the present market is largely confined to small lots. Under the quiet call for stocks there have been a few offerings available at 8¼c. per lb. but in most quarters 8½c. per lb. is given as the market quotation.

Prussiate of Soda—Domestic prussiate is reported to be moving steadily to consuming trades. Prices are quoted at 10@10½c. per lb. but sales are said to have gone through recently as low as 9½c. per lb. Imported material was quiet last week with 9¾c. per lb. asked for spot and shipments.

Miscellaneous Chemicals

Acetate of Lime—Returns from manufacturers indicate an improvement in demand for this chemical in April as compared with the preceding months of the year. Production in April also lowered and stocks on hand at the end of the month were 30,534,533 lb. as compared with 32,370,329 lb. at the end of March. Buying for export still suffers in comparison with the amounts taken last year as is shown by the official compilation that shipments in April were 1,420,898 lb., which compares with exports of 4,448,824 lb. in April, 1923. It is also noted that exports in April were less than in March. The domestic trade is reported to be buying moderately. Prices unchanged at $3 per 100 lb.

Arsenic—There were arrivals of arsenic during the week from Japan and Mexico. Some goods are said to have been sold ex-dock as low as 8¼c. per lb. Demand has been light and domestic arsenic was offered at 8¾c. per lb. Imported grades on spot were offered at 8½c. per lb.

Borax—Demand in some lines has been good but in other directions, notably the leather trade, consumption has been small for some months. Competition among sellers has been keen and bears out rumors heard earlier in the year that leading producers would contend strongly for business. Quotations are 4¾c. per lb. carlots, in bags; 5c. per lb. in bbl.; and 5½c. per lb. in kegs. Boric acid is held at 9c. per lb. in bbl.

Copper Sulphate—The tone has been easy with a falling off in buying orders. Domestic sulphate is reported to have sold at 4½c. per lb. The open quotation is 4.60@4.70c. per lb. Imported grades are quiet with spot material available at 4¾c. per lb. and shipments at 4½c. per lb. Imports in April are officially given at 709,476 lb.

Formaldehyde—Sales of moderate sized lots are reported at 9¾c. per lb. Carlots are freely offered at 9½c. per lb. and there is considerable competition among sellers for round lot business, which gives an unsettled appearance to the market.

Tin Salts—The decline to 48c. per lb. for tin oxide as reported in the preceding week has remained in force and offerings are free at the quoted figure. A lower schedule for June deliveries went into effect on June 2 for bichloride of tin and for tin crystals. The new quotations are 12c. and 31½c. per lb. respectively. The average price for Straits tin for May was 44.111c. per lb. as compared with 49.957c. per lb. for April.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	152.27
Last week	151.24
June, 1923	177.00
June, 1922	157.00
June, 1921	147.00
June, 1920	274.00
June, 1919	229.00
June, 1918	272.00

The advance of 103 points reflects the firmer attitude of sellers of crude cottonseed oil. Chemical price changes were few and rather unimportant.

Alcohol

Producers reported a fairly steady market for denatured alcohol. Deliveries against contract were good, but new business was inactive. Formula No. 1, special denatured, held at 45½c. per gal., in drums, carload basis.

Methanol production in April was placed at 673,746 gal., against 741,505 gal. in March and 713,643 gal. in April a year ago. The reduction in the output has improved the situation to some extent, but, with business still slow, the undertone continues to favor buyers. The 95 per cent grade held at 75c. per gal., in drums, carload lots.

Coal-Tar Products

Benzene Production Falls Off and Prices Steady—Refined Naphthalene Under Pressure—Pyridine Offerings Increase

THE past week witnessed another cut in the production of byproduct coke, causing a general tightening up in sellers' views on benzene. Prices, however, underwent no change, as new business was not sufficient in volume to warrant a higher trading basis. The unsettlement in prices for gasoline was a factor in the market. Solvent naphtha and toluene were in moderate supply and firm. The call for xylene was slow and prices for the different grades were barely steady. Consuming demand for naphthalene remains inactive. Imports of crude have been reduced, but this has not changed the general tone of the market, selling pressure being apparent in more than one direction, especially in the refined product. Substitutes for refined naphthalene have come on the market in a rather large way this season. Phenol was available at former prices, with buying interest in prompt shipment material not so urgent. Cresylic acid was offered freely and prices covering spot and forward deliveries were unsettled. Pyridine was quiet and somewhat lower.

Aniline Oil and Salt—Business continued along narrow lines and no changes occurred in prices. Recent sales in oil went through on the carload basis of 16c. per lb. drums extra. Salt was quiet and barely steady at 22@23c. per lb.

Benzidine — Offerings not large and market held at 80@82c. per lb., immediate delivery. Inquiry slow.

Benzene—While the demand could not be described as active, the fact that production continues to dwindle tends to steady the market in all quarters. Some of the smaller traders, according to reports, have little to offer. Quotations named at the close revealed no change in the trading basis, 90 per cent benzene holding at 23c. and the pure at 25c. per gal., tank cars, f.o.b. works.

Cresylic Acid—Several shipments of crude cresylic and coal-tar distillate arrived here from British ports in the past week. The market was easy in tone, but no change took place in prices named by leading sellers. Competition was keen and domestic producers showed willingness to meet the low prices quoted on material made with imported crude. On the 97 per cent grade nominal quotations range from 65@70c. per gal. Crude was offered at 58@60c. per gal.

Naphthalene—There was no improvement in the market for refined flake. Stocks are fairly large and weak holders have been sellers at concessions. Imports of crude in April, according to the Department of Commerce, amounted to 694,084 lb., which compares with 1,789,425 lb. in April a year ago. Imports in March of this year amounted to 1,084,008 lb. Refined flake closed nominally at 5@5½c. per lb., with ball at 5½@6c. per lb. Chips nominal at 4½c. per lb.

Paranitraniline — Demand restricted chiefly to small lots and prices barely steady at 68@72c. per lb., according to seller.

Phenol—Prices held at 26@28c. per lb., the inside figure obtaining on round lots for July delivery. It was reported that spot U. S. P. phenol sold at 28c. per lb. during the week. Demand was moderate, but with stocks not burdensome the undertone was fairly steady.

Solvent Naphtha — Production restricted and this tends to support prices. Water white, in tanks, held at 25c. per gal., f.o.b. works.

Pyridine—Foreign markets easier and this resulted in freer offerings here, the market settling at $4.85@$5.20 per gal.

Toluene—Demand slow, but with production light the views of sellers remain firm. Quotations repeated on basis of 26c. per gal., tank cars, works.

Furfural From Seeds

According to a Reuter dispatch from Russia, Professor Poraikoshits, of the Leningrad Institute of Applied Chemistry, has made a discovery of importance to the textile industry, having found a means of preparing furfural from sunflower seed husks instead of from coal tar as previously. The manufacture of furfural from the husks is said to be incomparably cheaper than the older method.

Vegetable Oils and Fats

Crude Cottonseed Higher on Small Stocks—Spot Linseed Steady—China Wood and Coconut Easy—Tallow Lower

LARGE consumers of vegetable oils and fats restricted operations to nearby wants only. A poor condition report on cotton attracted a good deal of attention early in the week, especially in the edible oils division, but as a market factor the subsequent weakness in lard made more of an impression. Lower prices were reported for Ceylon type coconut oil and china wood oil. Palm oil was available on spot below the prevailing cost of import. Soap makers bought tallow at a slight decline in price. Fish oils were neglected.

Cottonseed Oil—According to the Department of Agriculture the condition of the cotton crop on May 25 was 65.6 per cent of normal, the lowest condition, with the exception of 1920, of any like date in the past 50 years. After the publication of this unfavorable news the market for oil advanced. But the uplift was not of long duration, as weakness in lard discouraged speculative traders and liquidation in July refined oil brought out weakness. The option market, taken as a whole, was a narrow affair, most traders refusing to take a definite stand one way or the other until a better outlook might be had on this season's cotton crop. Cash trade in oil was spotty, while compound business was quiet. Refined oil on spot, on Thursday, settled at 9.80c. per lb. bid and 10c. per lb. asked, in bbl. The July option settled at 9.79c. bid. Crude oil appeared to be in firm hands as refiners experienced difficulty in locating sellers at 8¼c. per lb., which compares with 8c. a week ago. Bleachable oil was in demand, but offerings were small and the price nominal at 9c. per lb., tank cars, f.o.b. Texas common points. Lard compound was steady at 11½@11⅝c. per lb., carload lots, New York. Cash lard in Chicago settled at 10.17c. per lb. Stocks of lard in Chicago on June 1 amounted to 71,255,332 lb., which compares with 46,364,026 lb. on May 1 and 29,316,144 lb. on June 1 a year ago. Export trade was dull.

Linseed Oil—It was reported that paint manufacturers were able to move larger supplies of finished products and this was reflected in the better call for immediate shipment linseed oil. Virtually all crushers held out for 94c. per gal. on raw oil, in cooperage, carload lots, June delivery. Late June and early July delivery oil closed at 92c. per gal., with July at 91c. and August at 89@90c. The forward positions were nominal, as several sellers were anxious for business. Demand was good on nearby oil, but dull in the forward positions. Crop news from the Northwest was favorable. One report from a reliable source said that conditions in the flaxseed belt were generally satisfactory and there will be a surprising gain in acreage. Cash seed at Duluth was nominal at $2.38¾@$2.40¾ per bu. At Buenos Aires the market for seed eased off early in the week, but steadied later on renewed buying on the part of American and Continental buyers. Trade authorities now believe that the exportable surplus from the 1923-24 Argentine crop may not exceed 51,000,000 bu. Linseed cake for export was steady at $32.50 per ton, f.a.s. New York, June shipment.

China Wood Oil—Selling pressure developed and prices eased off. On the Pacific coast tank cars were offered down to 11¾@12¼c. per lb. Spot oil in the New York market was available at 13½@14c. per lb., the price varying according to seller.

Soya Bean Oil—June shipments from the Pacific coast closed unchanged at 9¾c. per lb., tank cars, duty paid. Bulk oil was nominal at 7c. per lb., c.i.f. Pacific coast ports. Trading quiet.

Cotton Condition Below 10-Year Average

In its first report of the season, issued June 2, the Department of Agriculture placed the condition of the cotton crop on May 25 as 65.6 per cent of normal. The condition is 7.2 per cent below the 10-year average. A forecast on production will be made July 2, as statistics of acreage are not collected until June 25.

Condition on May 25, by states, with comparisons, follow:

	1924	1923	1922	1921
N. Carolina	71	77	84	65
S. Carolina	68	64	67	58
Georgia	68	65	71	68
Alabama	70	70	80	57
Mississippi	69	70	75	60
Louisiana	70	68	70	57
Texas	66	77	61	71
Arkansas	58	66	76	70
Average	65.6	71.0	69.6	66.0

Coconut Oil—Bids were in the market at shade below asking prices and few transactions were reported. Ceylon type oil in sellers' tank cars offered at 8@8¼c. per lb., f.o.b. New York. Bulk oil for future delivery available at 7⅞c. per lb., c.i.f. New York, and at 7¾c. per lb., c.i.f. Pacific coast ports. Copra offered at 5c. per lb., c.i.f. New York.

Corn Oil—Crude sold at 8@8¼c. per lb., tank cars, f.o.b. point of production in the West. The market was firm at the close, asking prices ranging from 8¼@8¼c.

Olive Oil Foots—Distressed lots sold at 8½@9c. per lb., ex-dock. On shipments from Italy importers ask 9½c. per lb. A despatch from Madrid states that the olive oil market is completely paralyzed owing to the stoppage of exports.

Palm Oil—Spot Niger sold at 6.57c. per lb. Lagos sold at 7c. per lb., ex-dock. Import prices were nominal, owing to weakness in tallow. Lagos for shipments quoted at 7¼c., with Niger at 6⅞@6¾c., c.i.f. New York.

Rapeseed Oil — English refined on spot sold at 79c. July-August shipment from abroad steady at 77c. asked.

Tallow, Etc. — Late in the week a round lot of extra special tallow sold to a local soap maker at 6⅞c. per lb., f.o.b. plant, a decline of ⅛c. In London, at the weekly auction, good mixed tallow went off 6d. per 112-lb. Oleo stearine sold here at 9⅝c. per lb. Yellow grease steady at 6½@6⅝c. per lb.

Miscellaneous Materials

Antimony—Closing prices unsettled at 8⅜@8½c. per lb. on Chinese and Japanese brands. Demand inactive. Cookson's "C" grade offered at 12½c. per lb. Chinese needle, lump, nominal at 8½c. per lb. Powdered needle, 200 mesh, 9@10c. per lb. White oxide, Chinese, 99 per cent, 10@10½c. per lb.

Barytes — Reports indicate that no excess ore is being mined, which tends to steady prices. Water ground and floated, bleached, offered at $23 per ton f.o.b. St. Louis. Crude unchanged at $8 per ton, Missouri mines. On the 90@98 per cent crude Georgia mines quote $9 per ton.

Bauxite—Some inquiry for the iron free from chemical industry, otherwise the market remains quiet. Crushed and dried, $5.50@$8.75 per ton. Pulverized and dried, $12@$14 per ton. Calcined, crushed, $20 per ton, f.o.b. point of production. Dalmation, high grade, $6.50@$7.50 per ton.

Chalk—English, extra light, 5c. per lb. Domestic light, 4¼c.; heavy 3½@3¾c. per lb. English, in bulk, $5@$5.50 per ton, cargo basis, c.i.f. New York.

Fullers Earth — Powdered, imported, nominal at $23@$25 per ton, duty paid. Domestic, 16@30 mesh, $16.50 per ton; 16@60 mesh, $18 per ton, 60@100 mesh, $14 per ton, f.o.b. Midway, Fla.

Glycerine—Several cars of crude soap lye glycerine, basis 80 per cent, sold at 10¼c. per lb., loose, f.o.b. point of production in the Middle West, with additional offerings at this figure. Saponification, basis 88 per cent, nominal at 11¼c. per lb., loose, carload lots. Dynamite nominal at 15¾@16c. per lb. in drums, carload lots. Chemically pure on spot held at 16¼c. per lb., in drums, carload lots.

Naval Stores—Offerings increased and the market for spirits of turpentine declined fully 3c. per gal. in the past week, the settling price being 85c. per gal. Rosins also were lower, the ordinary grades closing at $5.50@$5.60 per bbl. Export demand quiet.

White Lead—There was a better feeling in the market for pig lead, but no important change took place in prices. Leading interests offered the metal at 7c. per lb., New York. The call for white lead was slightly better. Corroders maintained prices on the basis of 10¼c. per lb., for standard dry white lead, in casks, carload lots.

Zinc Oxide—The average price of zinc in the St. Louis market for the month of May was 5.793c. per lb., which compares with 6.121c. per lb. in April. The price of zinc oxide remained unchanged throughout the month of May. The first week in June witnessed a moderate call for oxide. American process, lead free, was maintained at 7⅞c. per lb., carload basis.

Imports at the Port of New York

May 30 to June 5

ACIDS—Cresylic—3 dr., Liverpool, W. C. Jordan & Bros.; 44 dr., Liverpool, Order; 22 dr., Glasgow, E. H. Watson. **Formic**—140 bx., Rotterdam, Order. **Phenol**—133 keg solid, Liverpool, Monsanto Chemical Works. **Stearic**—20 cs., Rotterdam, M. W. Parsons & Plymouth Org. Lab. **Tartaric**—215 keg, Rotterdam, **W. Benkert & Co.**; 50 keg, Rotterdam, **E. L. Bullock & Sons.**

ALUMINUM HYDRATE—450 bg., Rotterdam, R. W. Greeff & Co.

AMMONIUM CHLORIDE—35 csk., Antwerp, A. Klipstein & Co.

AMMONIUM CARBONATE — 15 csk., Liverpool, J. Turner & Co.; 11 cs., Liverpool, Brown Bros. & Co.

AMMONIUM SULPHATE—58 csk., Antwerp, E. Suter & Co.

ANTIMONY REGULUS — 250 cs., Shanghai, Wah Chang Trading Corp., 1,900 cs., Hankow, C. Hardy, Inc.; 500 cs., Shanghai, Order; 100 cs. Hankow, C. Hardy, Inc.

ARSENIC — 400 cs., Shanghai, Wah Chang Trading Corp.; 400 cs. Kobe, Kidder., Peabody Acceptance Corp., 500 cs., Kobe, Mitsui & Co.; 100 cs., Kobe, R. W. Greeff & Co.; 160 cs., Kobe, Frazar & Co; 200 cs., Kobe, Shima Trading Co.; 339 cs., Kobe, Order; 220 cs., Yokohama, Chemical Engineering Co.; 750 cs., Kobe, Takata & Co.; 150 cs., Kobe, Suzuki & Co.; 200 cs., Osaka, Pacific Orient Co.; 430 obl., Tampico, American Metal Co.

ASBESTOS—1,250 bg. crude, Beira, W. D. Crumpton & Co.

BARIUM CHLORIDE—65 csk., Rotterdam, E. Suter & Co.; 133 csk., Hamburg, Order.

BARYTES—100 l.g., Rotterdam, W. Benkert & Co.; 500 bg., Rotterdam, A. Klipstein & Co.; 300 l.g., Rotterdam, Roessler & Hasslacher Chemical Co.; 500 bg., Rotterdam, P. Uhlich & Co.; 25 csk., Hamburg, A. Hurst & Co.

CAMPHOR—400 cs., Shanghai, Hetherman & Co.; 405 cs., Shanghai, D. L. Moss & Co.; 200 cs., Shanghai, Eastman Kodak Co.

CHALK — 1 lot (in bulk), Dunkirk, Taintor Trading Co.; 1,250 bg., Antwerp, Brown Bros. & Co.; 700 bg., Antwerp, Lloyd Royal Belge.

CHEMICALS—7 pkg., Havre, Order; 40 cs., Bremen, Mallinckrodt Chemical Works; 20 cs., Antwerp, Order; 52 cs., Havre, E. Fougera & Co.; 55 csk. and 160 carboys, Rotterdam, Roessler & Hasslacher Chemical Co.; 23 cs., London, T. Nevin; 15 bbl., London, Order; 336 bg., Glasgow, Brown Bros. & Co.; 2 cs., Hamburg, Order; 159 csk., Hamburg, Jungmann & Co.

COAL-TAR DISTILLATE — 176 dr., Liverpool, Order.

COLORS—35 pkg., Havre, Ciba Co., Inc.; 7 csk. aniline, Bremen, American Exchange National Bank; 2 pkg. aniline, Genoa, Bernardo, Inc.; 5 csk. aniline, Irving Bank-Col. Trust Co.; 12 csk. aniline, Havre, Sandox Chemical Works; 6 pkg. do., Havre, Carbic Color & Chemical Co.; 22 cs. do., Havre, Ciba Co.; 45 pkg. aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 10 pkg. do., Rotterdam, W. C. Durfee; 31 csk. aniline, Hamburg, Order; 3 csk. do., Hamburg, Kuttroff, Pickhardt & Co.; 3 pkg. do., Hamburg, Franklin Import & Export Co.

COPPER OXIDE — 24 csk. Rotterdam, Roessler & Hasslacher Chemical Co.

CORUNDUM ORE — 618 bg., Durban, National Bank of South America.

CUTCH—500 bg., Singapore, Order.

DEXTRINE—150 bg., Copenhagen, Stein, Hall & Co.; 300 bg., Rotterdam, Stein, Hall & Co.

DIVI-DIVI—491 bg., Rio Hacha, Ultramares Corp.

FULLERS EARTH — 600 bg., London, L. A. Salomon & Bros.; 250 bg., Bristol, L. A. Salomon & Bros.

GAMBIER—271 cs., Singapore, Order.

GRAPHITE—250 bg., Havre, International Ores & Metal Selling Corp.; 375 bg., Kobe, Mitsui & Co.

GUMS—210 cs. copal, Singapore, France, Campbell & Darling; 156 cs. copal, 100 cs. damar and 38 bg. do., Singapore, L. C. Gillespie & Sons; 476 bg. damar, Singapore, Baring Bros. & Co.; 50 cs. do., Singapore, Guaranty Trust Co.; 25 cs. copal, Singapore, Brown Bros. & Co.; 50 cs. damar and 242 bg. do., Singapore, Order; 95 bg. copal, Manila, Innes & Co.; 203 cs. copal and 210 cs. damar, Singapore, Baring Bros. & Co.; 50 cs. damar, Singapore, Guaranty Trust Co.; 70 cs. damar, Singapore, Chemical National Bank; 150 cs. damar, Singapore, Order; 36 bg. copal, London, S. Winterbourne & Co.; 17 pkg. copal, Liverpool, Williams Shipping Agency; 826 bg. copal, Antwerp, Order; 94 bg. do., Antwerp, Chase National Bank.

IRON OXIDE—7 pkg., London, C. D. Stone & Co.; 74 csk., Rotterdam, Meteor Products Co.; 15 csk., Liverpool, Order; 114 bbl., Malaga, C. J. Osborn & Co.; 95 bbl., Malaga, C. K. Williams & Co.; 100 bbl., Malaga, Reichard-Coulston, Inc.; 23 bbl., Malaga, Am. Express Co.; 114 bbl., Malaga, Order; 7 csk., Liverpool, Reichard-Coulston, Inc.; 21 csk., Liverpool, Order.

LITHOPONE—125 csk., Antwerp, E. M. & F. Waldo; 1,400 csk., Antwerp, B. Moore & Co.

LOGWOOD—780 tons, St. Marc, Stamford Dyewood Co.; 335 bbl., Cape Haiti, Logwood Mfg. Corp.

Moderate Gain in Exports of Fertilizer Materials

Exports of fertilizers and fertilizer materials for the 10 months ended April 30 amounted to 881,587 tons, valued at $15,322,384, which compares with 766,013 tons, valued at $13,741,651, for the corresponding period a year ago. Exports for the 10 months, with a comparison, follow:

	1924, Tons	1923, Tons
Ammonium sulphate:		
Spain	3,878	586
Cuba	19,939	6,085
Dutch E. Indies	26,943	22,774
Hongkong	4,383	5,230
Japan	42,252	62,502
Philippines	14,482	4,990
Other countries	2,857	5,323
Phosphate rock	662,704	581,161
Superphosphates	45,468	30,572
Other fertilizers	54,377	41,374

LAMPBLACK—50 csk., Antwerp, L. H. Butcher & Co.; 400 bbl., Antwerp, C. J. Osborne & Co.

MAGNESITE — 215 bbl., Rotterdam, Brown Bros. & Co.; 250 bg., Antwerp, Order.

MAGNESIUM CHLORIDE — 354 dr., Hamburg, Innis, Speiden & Co.

MINERAL WHITE—480 bg., Liverpool, Hammill & Gillespie.

MYROBALANS — 4,220 bg., Calcutta, Order.

OILS—China Wood—470 tons (in bulk), Hankow, Jardine, Matheson & Co.; 180 csk., Hankow, A. Klipstein & Co.; 600 bbl., Shanghai, International Banking Corp. **Coconut**—15 pipes, Cochin, Volkart Bros.; 1,156 tons (in bulk), Manila. Order. **Linseed**—120 bbl., London, Order. **Palm**—35 csk., Belawan, V. E. Seyen. **Palm Kernel**—42 bbl., Antwerp, Petroleum Export & Marine Co.; 205 bbl., Liverpool, Order. **Perilla**—325 bbl., Dairen, Cook & Swan Co.; 200 bbl., Dairen, Hale & Co., 132 bbl., Darien, Balfour, Williamson & Co.; 100 bbl., Kobe, Shima Trading Co.; 100 bbl., Osaka, Shima Trading Co. **Sesame**—400 bbl., Copenhagen, Order. **Sardine**—500 bbl., Kobe, J. D. Irwin & Co.

OIL SEEDS — Copra — 382 bg., Port Morant, Franklin Baker Co. **Castor** — 7,438 bg., Dairen, I. R. Boody & Co.; 3,674 bg., Darien, I. R. Boody & Co. **Linseed**—8,595 bg., Buenos Aires, L. Dreyfus & Co.; 697 tons (in bulk), Buenos Aires, Spencer, Kellogg & Sons; 63,230 bg., Ibicuy, L. Dreyfus & Co.; 53,560 bg. and 1,802,759 kilos (in bulk), Rosario, Spencer, Kellogg & Sons. **Peanut**—1,000 bg. shelled, Kobe, Order.

PLUMBAGO — 250 bg. and 100 bbl., Colombo, National City Bank; 150 bbl., Colombo, Order; 675 bg., Colombo, Order.

POTASSIUM SALTS — 250 csk. alum, Rotterdam, A. Klipstein & Co.; 20 csk. bicarbonate, Rotterdam, La Curta & Funk; 252 csk. alum, Rotterdam, Superfos Co.; 1,016 bg. nitrate, Rotterdam, Kuttroff, Pickhardt & Co.; 4 csk. bicarbonate, Rotterdam, Order; 100 keg chlorate, Antwerp, E. Suter & Co.; 20 keg prussiate, Rotterdam, Order; 6 csk. sulpho-cyanide, Liverpool, Order; 1,000 bg. muriate and 181,438 kilos manure salt (in bulk), Hamburg, Potash Importing Corp. of Am.

QUEBRACHO—1,690 bg., Buenos Aires, Bank of Montreal; 14,684 bg., Buenos Aires, Tannin Corp.; 1,971 bg., Buenos Aires, Order.

QUICKSILVER — 60 flasks, Vera Cruz, Poillon & Poirier.

RUBBER LATEX—206,752 lb. (liquid in bulk), Port Swettenham, French-American Banking Corp.

SAL AMMONIAC—100 csk., Bristol, C. de P. Field Co.

SHELLAC—112 bg., Calcutta, Lee, Higginson Co.; 100 bg., Calcutta, Arbuthnot, Latham Co.; 100 bg., Calcutta, Brown Bros. & Co.; 400 bg., Calcutta, National City Bank; 238 bg., Calcutta, First National Bank, Boston; 25 cs., Calcutta, J. Munroe & Co.; 857 bg., Calcutta, Order; 780 bg., Calcutta, Order; 168 bg., Singapore, Order; 18 cs., Rotterdam, C. F. Gerlach, 167 bg., London, Order.

SILVER SULPHIDE—91 cs., Antofagasta, Watson, Geach & Co.

SODIUM SALTS—92 dr. sulphide, Rotterdam, A. Klipstein & Co.; 81 csk. phosphate, Rotterdam, Roessler & Hasslacher Chemical Co.; 25 csk. nitrate, Rotterdam, Kuttroff, Pickhardt & Co.; 87 csk. nitrite. Christiania, E. I. du Pont de Nemours & Co.; 45 csk. do., Christiania, Innis, Speiden & Co.; 204 bbl. silico fluoride, Copenhagen, Order; 224 cs. cyanide, Havre, International Banking Corp.; 23 csk. prussiate, Liverpool, C. Tennant & Sons; 224 dr. cyanide, Liverpool, Order; 4,217 bg. nitrate, Antofagasta, Anthony Gibbs & Co.; 21,838 bg. do., Iquique, Wessel, Duval & Co.; 10,772 bg. do., Iquique, E. I. du Pont de Nemours & Co.; 47 dr. metallic, Antwerp, F. A. Roloson; 1,046 csk. nitrate and 770 csk. nitrite, Rotterdam, Kuttroff, Pickhardt & Co.; 19 csk. prussiate, Rotterdam, Order; 73 dr. cyanide, Liverpool, Order; 7,992 bg. nitrate, Antofagasta, W. R. Grace & Co.; 15,871 bg., Iquique, W. R. Grace & Co.; 853 csk. nitrite, Hamburg, Order; 100 dr. sulphite, Bristol, R. F. Downing & Co.; 112 dr. cyanide, Liverpool, Order; 100 csk. hyposulphite, Hamburg, C. Hardy, Inc.

STEARINE PITCH—107 bbl., Rotterdam, Fuerst Bros.

STARCH — 850 bg. potato, Rotterdam, Stein, Hall & Co.

TALC—200 bg., Genoa, L. A. Salomon & Bros.

TARTAR — 267 bg., Naples, C. Pfizer & Co.

TURMERIC — 772 bg., Cochin, Volkart Bros.; 177 bg., Cochin, Order; 233 bg., Alleppy, Brown Bros. & Co.; 342 bg., Darragh, Smail & Co.; 272 bg., Alleppy, Volkart Bros.

VANADIUM—2,400 bg., Callao, Vanadium Corp. of Am.; 780 bg., Hamburg, Watson, Geach & Co.

VALONEA — 735 bg., Constantinople, Order.

VERMILION — 5 csk., London, C. H. Powell Co.; 10 csk., London, Pomeroy & Sons.

WAXES—50 bg. beeswax, Havana, Order; 320 bg. paraffine, Havre, Order; 143 bg. beeswax, Havre, Strohmeyer & Arpe Co.; 75 cs. vegetable, Liverpool, Guaranty Trust Co.; 25 cs. vegetable, London, Guaranty Trust Co.; 10 bg. beeswax, Talcahuano, Order.

ZINC OXIDE—206 bbl., Antwerp, Philipps Bros.; 125 csk., Antwerp, E. M. & F. Waldo.

ZINC WHITE—20 bbl., Gothenburg, W. C. Berling.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks.	lb.	$0.15 –	$0.15½
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 30%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.47 –	.48
Formic, 85%	lb.	.12½ –	.13
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½ –	.13
22% tech., light, bbl.	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½ –	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09¾ –	.10
Phosphoric, 50% carboys	lb.	.07 –	.08
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	14.00 –	15.00
Sulphuric, 66° drums	ton	18.00 –	19.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27 –	.28
Tartaric, domestic, bbl.	lb.	.30 –	....
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.25 –	.30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 –	....
Ethyl, 190 p'f, U.S.P., bbl.	gal.	4.81 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½ –	...
No. 1, 190 proof, special, dr.	gal.	.45½ –	...
No. 1, 188 proof, bbl.	gal.	.52½ –	...
No. 1, 188 proof, dr.	gal.	.48½ –	...
No. 5, 188 proof, bbl.	gal.	.50½ –	...
No. 5, 188 proof, dr.	gal.	.44½ –	...
Alum, ammonia, lump, bbl.	lb.	.03¼ –	.04
Potash, lump, bbl.	lb.	.02¾ –	.03½
Chrome, lump, potash, bbl.	lb.	.05½ –	.06
Aluminum sulphate, com., bags	100 lb.	1.35 –	1.40
Iron free bags	lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½ –	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12 –	.13
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.00 –	3.25
Antimony oxide, white, bbl.	lb.	.09¾ –	.10
Arsenic, white, powd., bbl.	lb.	.08½ –	.08¾
Arsenic, red, powd., kegs	lb.	.14½ –	.15½
Barium carbonate, bbl.	ton	61.00 –	66.00
Barium chloride, bbl.	ton	84.00 –	88.00
Barium dioxide, 88%, drums	lb.	.17½ –	.18
Barium nitrate, casks		.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.03¾ –	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.20 –	2.25
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	3.00 –	3.05
Calcium arsenate, dr.	lb.	.10 –	.10½
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07½
Camphor, Jap. cases	lb.	.73 –	.73½
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.07 –	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04¾
Domestic, heavy, bbl.	lb.	.03½ –	.04
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.04½ –	....
Contract, tanks, wks.	lb.	.04½ –	....
Cylinders, 100 lb., wks.	lb.	.05½ –	.07½
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.00 –	18.00
Copper carbonate, bbl.	lb.	.16½ –	.16¾
Copper cyanide, drums	lb.	.45 –	.46
Coppersulphate, dom., bbl., 100 lb.		4.50 –	4.65
Imp bbl.	100 lb.	4.37½ –	....
Cream of tartar, bbl.	lb.	.20½ –	.21
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.15 –	1.25
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr.	lb.	.14 –	.15
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Ethyl acetate, 99%, dr.	gal.	$1.08 –	$1.10
Formaldehyde, 40%, bbl.	lb.	.09½ –	.09¾
Fullers earth—f. o. b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.25 –	....
Fusel oil, ref., drums	gal.	3.50 –	4.00
Fusel oil, crude, drums	gal.	2.50 –	2.75
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16½ –	.16¾
Glycerine, dynamite, drums	lb.	.15½ –	.16
Glycerine, crude 80%, loose	lb.	.10½ –	.10¾
Hexamethylene, drums	lb.	.65 –	.75
Lead:			
White, basic carbonate, dry, casks	lb.	.10½ –	....
White, basic sulphate, casks	lb.	.09½ –	....
White, in oil, kegs	lb.	.12½ –	....
Red, dry, casks	lb.	.12 –	....
Red, in oil, kegs	lb.	.13½ –	....
Lead acetate, white crys., bbl.	lb.	.14½ –	....
Brown, broken, casks	lb.	.13½ –	....
Lead arsenate, powd., bbl.	lb.	.16 –	.18
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11½ –	....
Lithopone, bags	lb.	.06½ –	.06¾
Magnesium carb., tech., bags	lb.	.08½ –	.08¾
Methanol, 95%, bbl.	gal.	.80 –	....
Methanol, 97%, bbl.	gal.	.82 –	....
Methanol, pure, tanks	gal.	.80 –	....
drums	gal.	.82 –	....
bbl.	gal.	.87 –	....
Methyl-acetone, t'ks.	gal.	.73 –	.75
Nickel salts, double, bbl.	lb.	.09½ –	.10½
Nickel salts, single, bbl.	lb.	.10 –	.11
Orange mineral, csk	lb.	.14½ –	.15½
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½ –	.09¾
Potassium bromide, gran., bbl.	lb.	.22 –	.31
Potassium carbonate, 80-85%, calcined, casks	lb.	.05½ –	.05½
Potassium chlorate, powd.	lb.	.07½ –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.07½ –	.08
Potassium hydroxide (caustic potash) drums	lb.	.06¾ –	.07
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06 –	.07½
Potassium permanganate, drums	lb.	.14 –	.14½
Potassium prussiate, red, casks	lb.	.35 –	.38
Potassium prussiate, yellow, casks	lb.	.18½ –	.19
Salammoniac, white, gran., casks, imported	lb.	.06½ –	.06¾
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	18.00 –	20.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 –	....
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07¼ –	.07½
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.08½ –	$0.10
Sodium hyposulphite, bbl.	lb.	.02½ –	.02¾
Sodium nitrite, casks	lb.	.08½ –	.08¾
Sodium peroxide, powd., cases	lb.	.25 –	.28
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.03¾
Sodium prussiate, yel. bbl.	lb.	.09½ –	.10¼
Sodium salicylic, drums	lb.	.38 –	.40
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03½ –	.03½
Sodium sulphite, crys., bbl.	lb.	.02½ –	.03
Strontium nitrate, powd., bbl.	lb.	.10 –	.10½
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08
Tin bichloride, bbl.	lb.	.12 –	....
Tin oxide, bbl.	lb.	.48 –	....
Tin crystals, bbl.	lb.	.31½ –	....
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.05 –	.05½
Zinc cyanide, drums	lb.	.36½ –	.37
Zinc dust, bbl	lb.	.08 –	.08½
Zinc oxide, lead free, bag	lb.	.07¾ –	....
5% lead sulphate, bags	lb.	.07½ –	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10¼ –	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	3.00 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.65
Alpha-naphthol, ref., bbl.	lb.	.75 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthraquinone, 25% paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.e. drums	lb.	1.60 –	....
tech, drums	lb.	68	.72
Benzene, pure, water-white, tanks, works	gal.	.25 –	....
Benzene, 90%, tanks, works	gal.	.23 –	....
Benzidine base, bbl.	lb.	.80 –	.82
Benzidine sulphate, bbl.	lb.	.70 –	.72
Benzoic acid, U.S.P., kegs	lb.	.82 –	85
Benzoate of soda, U.S.P., bbl.	lb.	65 –	.70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresol, U.S.P., drums	lb.	.22 –	.26
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.65 –	.70
95-97%, drums, works	gal.	.60 –	.65
Dichlorbenzene, drums	lb.	.07 –	.08
Diethylaniline, drums	lb.	.55 –	....
Dimethylaniline, drums	lb.	.36 –	.38
Dinitrobenzene, bbl.	lb.	.15 –	.17
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
Diphenylamine, bbl.	lb.	.48 –	.50
H-acid, bbl.	lb.	.72 –	.75
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.05 –	.05½
Naphthalene, balls, bbl.	lb.	.06 –	.06½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.30
Nitro-toluene, drums	lb.	.13½ –	.14
N-W acid, bbl.	lb.	1.00 –	1.05
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.12 –	.13
Ortho-nitrophenol, bbl.	lb.	1.25 –	1.30
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.12 –	.13
Para-aminophenol, base, kegs	lb.	1.20 –	1.25
Para-aminophenol, HCl, kegs	lb.	1.30 –	1.40
Para-dichlorbenzene, bbl.	lb.	.17 –	20
Paranitraniline, bbl.	lb.	.68 –	.70
Para-nitrotoluene, bbl.	lb.	.58 –	.60
Para-phenylenediamine, bbl.	lb.	1.40 –	1.50
Para-toluidine, bbl	lb.	.72 –	.80
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.26 –	.28
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	25.00 –	30.00
Pyridine, imp., drums	gal.	4.85 –	5.25
Resorcinol, tech., kegs	lb.	1.30 –	1.40

Resorcinol, pure, kegs	lb.	$1.90 –	$2.00
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.31 –	.32
Salicylic acid, U.SP., bbl	lb.	.35 –	...
Solvent naphtha, water-white, tanks	gal.	.25 –	....
Crude, tanks	gal.	.22 –	....
Sulphanilic acid, crude, bbl	lb.	.16 –	.18
Toluidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	....
Toluene, drums, works	gal.	.30 –	....
Xylidine, drums	lb.	.48 –	.50
Xylene, 5 deg.-tanks	gal.	.40 –	....
Xylene, com., tanks	gal.	.28 –	....

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.50 –	$5.55
Rosin E-I, bbl.	280 lb.	5.65 –	5.70
Rosin K-N, bbl.	280 lb.	5.90 –	6.10
Rosin W.G.-W.W., bbl.	280 lb.	7.10 –	7.70
Wood rosin, bbl.	280 lb.	5.40 –	5.50
Turpentine, spirits of, bbl.	gal.	.84 –	.85
Wood, steam dist., bbl.	gal.	.78 –	.....
Wood, dest. dist., bbl.	gal.	.58 –	.60
Pine tar pitch, bbl.	200 lb.	5.50 –	.....
Tar, kiln burned, bbl.	500 lb.	10.50 –	.....
Retort tar, bbl.	500 lb.	10.50 –	.....
Rosin oil, first run, bbl.	gal.	.40 –	.....
Rosin oil, second run, bbl.	gal.	.45 –	.....
Rosin oil, third run, bbl.	gal.	.50 –	.....
Pine oil, steam dist.	gal.	.62 –	.....
Pine tar oil, ref.	gal.	.46 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.06½ –	.06½
Lard oil, Extra No. 1, bbl.	gal.	.85 –	.....
Lard compound, bbl.	lb.	.11½ –	.11¾
Neatsfootoil 20 deg. bbl.	gal.	1.26 –	.....
No. 1, bbl.	gal.	.86 –	.88
Oleo Stearine		.09¼ –	.....
Oleo oil, No. 1, bbl.	lb.	.12¼ –	.12½
Red oil, distilled, d.p. bbl.	lb.	.08½ –	.09¼
Saponified, bbl.	lb.	.08½ –	.09¼
Tallow, extra, loose works	lb.	.06¼ –	.....
Tallow oil, acidless, bbl.	gal.	.82 –	.....

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.15½ –	.....
Castor oil, No. 1, bbl.	lb.	.16 –	.....
Chinawood oil, bbl.	lb.	.13½ –	.14
Coconut oil, Ceylon, bbl.	lb.	.09¼ –	.09½
Ceylon, tanks, N.Y.	lb.	.08 –	.08½
Coconut oil, Cochin, bbl.	lb.	.09½ –	.....
Corn oil, crude, bbl.	lb.	.10 –	.10½
Crude, tanks, (f.o.b. mill)	lb.	.08¼ –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08¼ –	.....
Summer yellow, bbl.	lb.	.10 –	.10½
Winter yellow, bbl.	lb.	.11½ –	.11½
Linseed oil, raw, car lots, bbl.	gal.	.94 –	.....
Raw, tank cars (dom.)	gal.	.88 –	.....
Boiled, cars, bbl. (dom.)	gal.	.96 –	.....
Olive oil, denatured, bbl.	gal.	1.20 –	1.25
Sulphur, (foots) bbl.	lb.	.09 –	.09½
Palm, Lagos, casks	lb.	.07 –	.07½
Niger casks	lb.	.06½ –	.06½
Palm kernel, bbl.	lb.	.09 –	.09½
Peanut oil, crude, tanks (mill)	lb	.11 –	.....
Peanut oil, refined, bbl.	lb.	.14½ –	.14½
Perilla, bbl	lb.	.14 –	.14½
Rapeseed oil, refined, bbl.	gal.	.79 –	.80
Sesame, bbl.	lb.	.10½ –	.10½
Soya bean (Manchurian), bbl.	lb.	.11½ –	.11½
Tank, f.o.b. Pacific coast	lb.	.09½ –	.10
Tank, (f.o.b. N.Y.)	lb.	.10½ –	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.60 –	$0.62
Menhaden, light pressed, bbl.	gal.	.58 –	.....
White bleached, bbl.	gal.	.60 –	.....
Blown, bbl.	gal.	.64 –	.....
Crude, tanks (f.o.b. factory)	gal.	.47½ –	.50
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$28.00 –	29.00
Cottonseed meal, f.o.b. mills	ton	34.00 –	35.00
Linseed cake, bags	ton	34.00 –	34.50
Linseed meal, bags, spot	ton	39.00 –	41.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.13½ –	.14¼
Dextrine, corn, bags	100 lb.	3.64 –	3.91
Dextrine, gum, bags	100 lb.	3.99 –	4.09
Divi-divi, bags	ton	40.00 –	42.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.11¼ –	.12½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	..... –	.....
Sumac, ground, bags	ton	160.00 –	170.00
Sumac, domestic, bags	ton	50.00 –	55.00
Starch, corn, bags	100 lb.	3.07 –	3.33
Tapioca flour, bags	lb.	.05½ –	.06¼

Extracts

Archil, cone., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.01½ –	.02¾
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09⅜ –	.10
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.08 –	.09
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Osage Orange, powder, bg.	lb.	.14 –	.15
Quebracho, solid, 65% tannin, bbl.	lb.	.05 –	.05½
Sumac, dom., 51°, bbl.	lb.	.07 –	.07½

Dry Colors

Blacks–Carbongns, bags, f.o.b. works, contract	lb.	$0.03 –	$0.11
spot, cases	lb.	.12 –	.16
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.38 –	.40
Prussian, bbl.	lb.	.38 –	.40
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.11½ –	.12
Paris, bulk	lb.	.25 –	.26
Reds, Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.35 –	1.40
Yellow, Chrome, C.P. bbls.	lb.	.17 –	.18
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.20 –	$0.21
Beeswax, crude, Afr. bg.	lb.	.24½ –	.25
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candelilla, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.38 –	.39
No. 2, North Country, bags	lb.	.29 –	.30
No. 3, North Country, bags	lb.	.21½ –	.22½
Japan, cases	lb.	.24 –	.25
Montan, crude, bags	lb.	.05½ –	.06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.05½ –	.....
Crude, scale 124-126 m.p. bags	lb.	.04½ –	.04¾
Ref., 118-120 m.p., bags	lb.	.05 –	.05½
Ref., 123-125 m.p., bags	lb.	.05½ –	.....
Ref. 128-130 m.p., bags	lb.	.05½ –	.05¾
Ref., 133-135 m.p., bags	lb.	.06 –	.....
Ref., 135-137 m.p., bags	lb.	.06½ –	.07
Stearic acid, agle pressed, bags	lb.	.10½ –	.....
Double pressed, bags	lb.	.11 –	.....
Triple pressed, bags	lb.	.12½ –	.....

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.60 –	.....
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	..... –	.....
Nitrate of soda, bags	100 lb.	2.60 –	.....
Tankage, high grade, f.o.b. Chicago	unit	2.20 –	.....
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.25 –	3.70
Tennessee, 75%	ton	6.75 –	7.00
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	45.85 –	.....
Double manure salt	ton	26.35 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.19½ –	.....
Upriver coarse	lb.	.14½ –	.....
Upriver caucho ball	lb.	.14½ –	.....
Plantation—First latex crepe	lb.	.19½ –	.....
Ribbed smoked sheets	lb.	.19½ –	.....
Amber crepe No. 1	lb.	.19½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.09 –	$0.14
East Indian, bold, bags	lb.	.14 –	.15
Manila, pale, bags	lb.	.18 –	.19
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.22½ –	.23
Singapore, No. 1, cases	lb.	.28 –	.29
Singapore, No. 2, cases	lb.	.19 –	.19½
Kauri, No. 1, cases	lb	.60 –	.65
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.08 –	.11

Shellac

Shellac, orange fine, bags	lb.	$0.56 –	$0.57
Orange superfine, bags	lb.	.58 –	....
A. C. garnet, bags	lb.	.52 –	....
Bleached, bonedry	lb.	.64 –	.....
Bleached, fresh	lb.	.53 –	.54
T. N., bags	lb.	.53 –	.54

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$300.00 –	$400.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00 –	70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	23.00 –	24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	8.50
Casein, bbl., tech.	lb.	.10½ –	.11½
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.50 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	7.00 –	7.50
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 soap	long ton	6.75 –	7.00
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½ –	.06
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.12½ –	.13
Gum tragacanth, sorts, bags	lb.	.48 –	.50
No. 1, bags	lb.	1.20 –	.....
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 –	45.00
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl.	lb.	.06 –	.08
Dom., ground, bbl.	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Silica, glass sand, f.o.b. Ill.	ton	2.00 –	2.50
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 –	8.00
Tale, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
Tale, 200 mesh, f.o.b. Ga., bags	ton	8.00 –	10.00
Tale, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.75 –	$4.25
Corning	bbl.	2.15 –	.....
Cabell	bbl.	1.95 –	.....
Somerset	bbl.	2.05 –	2.25
Illinois	bbl.	2.07 –	.....
Indiana	bbl.	2.08 –	.....
Kansas and Okla. under 28 deg.	bbl.	1.00 –	.....
California, 35 deg. and up	bbl.	1.40 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.20 –	.....
Naphtha, V. M. & P. deod, steel bbls	gal	.19 –	.....
Kerosene, ref. tank wagon	gal.	.14 –	.14½
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.31 –	.37
Bloomless, 30@31 grav.	gal.	.22 –	.23
Paraffin, pale 885 vis	gal.	.17 –	.17½
Spindle, 200, pale	gal.	.22 –	.....
Petrolatum, amber, bbls.	lb.	.04½ –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	38–40
Silicon carbide refract. brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	.....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	
4-6% C	lb.	.11½–	
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	107.50 –	
Spiegeleisen, 19-21% Mn	gr. ton	36.00 –	38.00
Ferromolybd enum, 50-60% Mo, per lb. Mo.	lb.	2.00 –	2.25
Ferrosilicon, 10-12%	gr. ton	41.50 –	46.50
50%	gr. ton	75.00 –	
Ferrotungsten, 70-80%, per lb. of W	lb.	.90 –	.93
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	
C.i.f. Atlantic seaboard	ton	19 00 –	22.00
Coke, fdry., f.o.b. ovens	ton	4.50 –	5.00
Coke, furnace, f.o.b. ovens	ton	3.25 –	3.40
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50 –	
Ilmenite, 52% TiO_2 Va	lb.	.01½–	
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.42 –	.46
Manganese ore, chemica (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.80 –	
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten, scheelite, 60% WO_3 and over	unit	9.25 –	
Tungsten, wolframite, 60% WO_3	unit	9.00 –	9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	2.50
Vanadium pent oxide, 99%	lb.	2.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.12½–	$0.12¾
Aluminum, 98 to 99%	lb.	.27 –	.28
Antimony, wholesale, Chinese and Japanese	lb.	.08¾–	.08¾
Nickel, 99%	lb.	.27 –	.30
Monel metal, shot and blocks	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.42½	
Lead, New York, spot	lb.	.07	
Lead, E. St. Louis, spot	lb.	.06¾	
Zinc, spot, New York	lb.	.0620	
Zinc, spot, E. St. Louis	lb.	.0585	
Silver (commercial)	oz.	.67¾	
Cadmium	lb.	.60	
Bismuth (500 lb. lots)	lb.	2.35–2.40	
Cobalt	lb.	2.50–3.00	
Magnesium, ingots, 99%	lb.	.90–.95	
Platinum, refined	oz.	116.00	
Iridium	oz.	260.00–270.00	
Palladium	oz.	78.00–83.00	
Mercury	75 lb.	75.00–76.00	
Tungsten powder	lb.	.95–1.00	

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.25
Copper bottoms	29.25
Copper rods	19.75
High brass wire	17.75
High brass rods	15.00
Low brass wire	19.50
Low brass rods	20.50
Brazed bronze tubing	24.34
Seamless copper tubing	22.75
Seamless high brass tubing	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible	10.50 @ 10.75
Copper, heavy and wire	10.00 @ 10.12½
Copper, light and bottoms	8.50 @ 8.62½
Lead, heavy	5.87½@ 6.12½
Lead, tea	4.00 @ 4.25
Brass, heavy	6.00 @ 6.25
Brass, light	4.75 @ 4.87½
No. 1 yellow brass turnings	6.50 @ 6.75
Zinc scrap	3.50 @ 3.75

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.49	$3.49
Soft steel bars	3.49	3.49
Soft steel bar shapes	3.59	3.59
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.59	3.59

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

HUNTSVILLE—The Manganese Products Corp., Huntsville, has acquired tracts of manganese properties in Georgia and Tennessee, totaling about 1,850 and 950 acres, respectively, and plans for the installation of commercial reduction plants. It is purposed to develop an output of about twenty cars per day. As recently announced, the company also contemplates the operation of a plant in the vicinity of Huntsville. Edward Doty, Huntsville, is acting secretary.

Arizona

JEROME—The United Verde Copper Co. has tentative plans under advisement for the installation of a new flotation plant at its properties, designed to handle low-grade ores. It will have an initial capacity of about 1,000 tons. Robert Tally is manager.

PHOENIX—The Gypsum Products Co., recently organized, will begin the construction of a new plant at 16th St. and line of the Arizona Eastern Railway Co., consisting of a number of 1-story buildings, for which a contract has been let to the Mine & Smelter Equipment Co., 230 East Adams St. A list of equipment for the gypsum mill will be arranged at an early date. Gilmore Goodland heads the new organization.

TUCSON—The Silver Lillie Copper Mines Co. is developing a fund for the installation of a new concentrating mill at its local properties for handling low-grade ores. It is expected to perfect plans for the unit at an early date. F. H. Perkins, 920 North 3rd St., Phoenix, Ariz., is general manager.

California

COMPTON—The Union Oil Co., Los Angeles, has commenced work on a new local gas absorption plant for gasoline production, and will install equipment for an initial output of about 15,000 gal. per day.

SAN FRANCISCO—The Engels Copper Mining Co., Mills Bldg., has plans for extensions and improvements in its plant in Plumas County, to include the installation of additional machinery for considerable increase in production. A bond issue of $500,000 is being sold, the proceeds to be used for the expansion. E. E. Paxton is treasurer and general manager.

PLEASANTON—The Griffin Envelope Co., 25 Fremont St., San Francisco, has preliminary plans under way for the erection of a new local plant for the manufacture of a line of paper and pulp products, estimated to cost close to $60,000, with equipment. A site has been selected.

BAKERSFIELD—The Richfield Oil Co. has authorized plans for the immediate rebuilding of the portion of its local refining plant, recently destroyed by fire with loss estimated at $300,000, including equipment and stock. The reconstruction is expected to cost close to a like amount. From forty-five to fifty new tanks will be installed. C. M. Fuller is president; A. M. Kelley is local manager.

POTRERO—The Pacific Gas & Electric Co., 445 Sutter St., San Francisco, will soon commence the construction of a new compressor plant at its local artificial gas works, vicinity of Kentucky and 24th Sts., estimated to cost about $135,000, with equipment. A number of filter pits will also be installed, to cost approximately $58,000. H. Bostwick is division manager.

Connecticut

STAMFORD—The Phillips Chemical Co., Glenbrook, has awarded a general contract to the Stephen Moriarty Co., Stamford, for the erection of a 3-story addition to its plant, 60x80 ft., for general increase in output. Work will be placed in progress at once.

BRIDGEPORT—The Hubert Art Glass Co., recently organized to take over and expand the Bridgeport Art Glass Co., will occupy three buildings at 253-71 John St., to be devoted to the production of art glass windows and other products, with departments for beveling, polishing, assembling, etc. Joseph Hubert is president.

Delaware

SOUTH WILMINGTON—The Hearn Oil Co., Wilmington, has acquired local property and buildings, comprising a tract of about 6 acres, heretofore held by the Bethlehem Steel Co., as a site for a new oil storage and distributing plant, for which plans will be prepared at an early date. It will cost about $100,000, with equipment. Claude P. Hearn is president.

Florida

SOUTH JACKSONVILLE—The Florida Paper Mills Co., Gilbert D. Leach, Leesburg, Fla., secretary, is proceeding with preliminary work on its proposed local paper mills, to cost in excess of $200,000, with equipment. Contracts for machinery and operating equipment are expected to be awarded within the next 30 to 60 days. It is stated that no awards will be made prior to that time.

CLEARWATER—The City Council is said to be perfecting plans for the installation of an artificial gas plant, for which a bond issue of $150,000 has recently been sold.

Kentucky

LOUISVILLE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron sanitary ware, has awarded a general contract to L. W. Hancock, Louisville Trust Bldg., for the erection of the proposed addition to its local plant, to be equipped as a foundry. It will be 1-story and basement, 140x180 ft., estimated to cost $150,000, with equipment. The site is at Shipp and 7th Sts. Joseph & Joseph, Francis Bldg., Louisville, are architects.

ASHLAND—The Ashland Clay & Metal Products Co. will begin the immediate erection of its proposed local plant, consisting of two 1-story buildings, 50x150 ft. and 50x300 ft., respectively. Work will be carried out by day labor. A considerable portion of the plant will be equipped as a foundry for the production of gray iron, brass, bronze and other metal castings. R. R. Peebles is president.

Louisiana

BAYOU GOULA—The J. Supple's Sons Planting Co., Ltd., plans for improvements at its sugar mill at Catherine, Iberville Parish, near Bayou Goula, including machinery repairs and replacements. The work will be carried out during the summer season.

Maryland

BALTIMORE—The Seaboard Terminal Corp., represented by Jerome Sloman, Union Trust Bldg., attorney, has acquired a tract of about 70 acres of land in the Curtis Bay section, and has plans in progress for the construction of a new oil refining and distributing plant, designed primarily for export service. It will consist of a number of units, estimated to cost approximately $1,000,000, with machinery.

HAGERSTOWN—Fire, May 24, destroyed a portion of the local plant of the Central Chemical Co., manufacturer of fertilizer products, with loss estimated at $125,000, including equipment. It is said that tentative plans are under consideration for rebuilding.

BALTIMORE—Continuing its expansion, the Locke Insulator Corp., Charles and Cromwell Sts., manufacturer of porcelain insulators for electrical service, has awarded a general contract to J. Henry Miller, Inc., 405 West Franklin St., for a 1-story addition, 100x275 ft., to be equipped largely for testing work. It is estimated to cost in excess of $90,000.

Michigan

WYANDOTTE—The Huron Portland Cement Co., operating a local mill in conjunction with the Michigan Alkali Co., has commenced the erection of a new plant unit on adjoining site, to be used for reserve service. It will be equipped for an initial output of 5,000 bbl. per day, and is estimated to cost close to $250,000, with machinery. It is expected to have the plant ready for service early in the coming year. John B. Ford is president.

SAGINAW—The Sears Paper Co. is considering plans for the erection of a 2-story mill, estimated to cost $50,000, to replace a portion of its local plant recently destroyed by fire. It will be located on Hayden Ave. Herman J. Sears is head.

BAY CITY—The Wildman Rubber Co. is pushing construction on its local plant and plans to have ready for production at an early date. It will be used for the manufacture of automobile tires. Work will be commenced on a 1-story power house, 48x83 ft., with 125-ft. radial brick stack.

PORT HURON—The Dunn Sulphite Paper Co., recently organized, has filed plans for the erection of the initial unit of its proposed local mill, and will proceed with work at once. It is estimated to cost approximately $100,000, with equipment.

DETROIT—The Michigan Copper & Brass Co., 5851 West Jefferson Ave., has broken ground for the erection of a 1-story addition to its plant, 86x405 ft., estimated to cost about $150,000, with equipment. It is purposed to have the structure ready for service in August, Lane, Davenport & Peterson, Dime Bank Bldg., are architects.

Minnesota

ST. PAUL—The Craig Oil Refining Co., Eaton and Morrison Sts., is said to have tentative plans under consideration for the rebuilding of the portion of its local plant recently destroyed by fire with loss estimated in excess of $400,000, including equipment.

Missouri

KANSAS CITY—The Red Star Yeast & Products Co., 79 Buffalo St., Milwaukee, Wis., has rejected bids recently received for the construction of its proposed local branch plant, and will have revised plans drawn at once. It is expected to ask new bids at an early date. The plant will be 1- and 2-story, 50x120 ft. E. R. Leibert, 432 Broadway, Milwaukee, is architect.

KANSAS CITY—The Lavex Chemical Co., 4113 Pennsylvania Ave., operating the Regal Products Co., same address, is considering an expansion program, to include the erection of a 1-story addition, 75x100 ft., for the manufacture of a line of chemical specialties. It is likely that actual work will be deferred for several months. Reynolds Barnum is president.

New Jersey

TRENTON—Following the formation of the Federated Metals Corp., New York, to take over and merge the properties of B. Lissberger & Co., Woolworth Bldg., New York, and other interests, the Trenton Smelting & Refining Co., Canal and Pearl Sts., one of the units in the consolidation, is said to have preliminary plans under way for extensions and improvements in its local refining plant, used primarily for the production of refined zinc in the form of slabs, and affiliated products.

HOBOKEN—The Ohio Chemical Co., 1201 Adams St., has filed plans for the erection of a new 1-story works, for which plans have been prepared by George C. Brokhaus, 89 Washington St.

New York

NEW YORK—Oscar Goldschlag, 1482 Broadway, architect, has completed plans for the erection of a new 1-story plant on 133rd St., to be 30x100 ft., equipped for the manufacture of celluloid products. The owner's name will be announced at a later date. It is expected to begin work at an early date. It will cost $35,000.

BUFFALO—The Hall Paint Co. has acquired the 3-story building at 443 Genesee St., heretofore occupied in part, and plans to use the entire structure for expansion at an early date. A factory will also be operated at 1542 Hertel Ave.

North Carolina

WINSTON-SALEM—The Atlantic Bitulithic Co. is said to have preliminary plans under advisement for the rebuilding of the portion of its plant, recently destroyed by fire. An official estimate of loss has not been announced.

Ohio

TIFFIN—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., will hold in temporary abeyance the erection of the proposed addition to its local sanitary ware pottery, estimated to cost $45,000, for which plans have been drawn by G. W. Netcher, 11½ South Washington St., Tiffin, architect.

Oklahoma

OKLAHOMA CITY—The Campbell Flavoring & Extract Co., 201 South Compress St., is planning for extensions and improvements in its plant to cost close to $25,000, with equipment. V. V. Campbell is president.

Pennsylvania

KANE — W. A. James, Kane, and associates have organized the Pennsylvania Plate Glass Co., under Delaware laws, with capital of $750,000, to construct and operate a plant in this section, for plate and other sheet glass production. Plans for the initial units will be drawn at an early date. A site has been selected. The plant will cost close to $450,000, including equipment.

READING — The Carpenter Steel Co., Exeter St., is completing plans and purposes to begin work at an early date on a 1-story addition to its mill on the River Rd., estimated to cost $200,000, with equipment. F. A. Bigelow is president.

South Carolina

SPARTANBURG—The City Council plans for the construction of a filtration plant in connection with its proposed waterworks and water supply system, estimated to cost $1,350,000, in which amount bonds are being arranged. Paul Norcross, Atlanta, Ga., is consulting engineer.

Texas

BRECKENRIDGE—The Westover Oil & Gas Co., operated by the Hope Engineering & Supply Co., Farmers Bank Bldg., Pittsburgh, Pa., has plans under way for the construction of a gasoline-refining plant on neighboring site, estimated to cost $450,000, with machinery. It will have a capacity of 30,000 gal. daily.

Wisconsin

TWO RIVERS—The Becker Mfg. Co. is planning for the erection of an addition to its foundry for the production of iron castings. (Recently incorrectly noted under Minnesota.)

New Companies

CAPITOL CHEMICAL CO., Somerville, Mass.; chemicals and chemical byproducts; $10,000. James A. Palmer, 101 Forest Hill St., Jamaica Plain, Mass., is president and treasurer.

CENTRAL POTTERY CO., Greeneville, Tenn.; pottery and kindred ceramic ware; $30,000. Incorporators: W. H. Armitage and S. J. Millikin, both of Greeneville.

S. & F. MFG. CO., Buffalo, N. Y.; dyes and chemicals; $25,000. Incorporators: J. D. Pollock, J. G. Fisher and A. L. Schneider. Representative: Charles W. Pooley, Iroquois Bldg., Buffalo.

IT SHOE POLISH CO., INC., 111 North Greene St., Baltimore, Md.; shoe dressings, cleaning compounds, etc.; $150,000. Incorporators: Guy D. Nottingham and James J. McDonnell.

GRACE FELDSPAR CO., Newtown, Conn.; to operate feldspar and other mineral properties for commercial production; $7,000. Incorporators: Henry Warner and Victor A. Nelson, 8 Bates Pl., Danbury, Conn.

RACE-TURNER CO., INC., Newark, N. J.; paper products; $50,000. Incorporators: Arthur R. Turner, Wilbur F. Wriggins and F. Oscar Race, 24 Scott St., Newark. The last noted is representative.

NIELSEN PRODUCTS CO., Detroit, Mich.; chemicals and chemical compounds; $5,000. Incorporators: Glenn D. Welcher, Arthur Roedel and Claudius Nielsen, 6502 Devereaux St., Detroit. The last noted is representative.

MYRROHL CHEMICAL CO., San Francisco, Calif.; chemicals and chemical byproducts; $100,000. Incorporators: F. A. Seymour, G. M. Rant and Fred J. Hildebrand. Representative: Oscar T. Barber, United Bank & Trust Bldg., San Francisco.

BOSTON PUTTY WORKS, INC., Boston, Mass.; putty, composition products, etc.; $50,000. Saul Shurdut is president; and Philip Shurdut, 96 Lawrence St., Roxbury, Mass., treasurer and representative.

OIL EMULSION CORP., Rochester, N. Y.; refined oils and compounds; $10,000. Incorporators: J. F. Wallace, E. J. Lefevre and W. A. Yale. Representative: Werner & Harris, Rochester, attorneys.

METALIZATION PAINT CO., INC., Los Angeles, Calif., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del., representative; special metallic paints, etc.; $250,000. Incorporators: Edward M. H. Rosenberg, I. Behrstock and Harry N. Wolfe, all of Los Angeles.

FIRE-O-CIDE CHEMICAL CORP., Hoboken, N. J.; chemicals and chemical compounds; $125,000. Incorporators: John L. Victoria, William F. House and Alfred Widrow. Representative: George Widrow, 53 Newark St., Hoboken.

COBBLER SODA CO., Schenectady, N. Y.; soda and other chemical products; $25,000. Incorporators: F. Longe, M. and A. Lambis. Representative: D. B. Salmon, Schenectady.

B. H. & M. OIL CO., Meridian, Miss.; refined petroleum products; $500,000. Incorporators: H. F. Broach and Walter Hodges, both of Meridian.

HELMERICH GLASS CO., 719 Fulton St., Chicago, Ill.; glass products; $20,000. Incorporators: Joseph E. Flanagan, F. J. Drehobl and M. J. Eberhardt.

OLBER CHEMICAL CO., Newark, N. J.; chemicals and chemical byproducts; $50,000. Incorporators: Meyer, Franklin and Carl Olsan, 185 Market St., Newark. The last noted is representative.

BLURIDGE MICA CORP., Wilmington, Del., care of the Colonial Charter Co., Ford Bldg., Wilmington representative; to operate mica, feldspar and other mineral properties for commercial production.

UNION CHEMICAL CO., New York, N. Y.; chemicals and chemical byproducts; $400,000. Incorporators: A. L. and M. Fine. Representative: S. Gordon, 14 West 44th St., New York.

OTTO R. GREINER CO., INC., Newark, N. J.; glass products; $100,000. Incorporators: Otto R. and Robert H. Greiner, and Franz Wiegand. Representative: Joseph J. Quinn, 738 Broad St., Newark.

MARJACK OIL CO., Tulsa, Okla.; petroleum products; $50,000. Incorporators: Shell S. Bassett and John F. Gray, both of Tulsa.

EAGLE PAPER CO., Hartford, Conn.; paper products; $50,000. Incorporators: Nathan F. Rubin and Alexander J. Tulin, 26 Seyms St., Hartford.

MYSTICAL CHEMICAL CO., Wilmington, Del., care of the Colonial Charter Co., Ford Bldg., Wilmington, representative; $250,000; washing fluids, chemical compounds, etc.

T. M. G. RUBBER SPECIALTY CORP., New York; rubber products; nominal capital $5,000. Incorporators: M. F. Heiz, P. Senner and R. E. Tuttle. Representative: J. M. Lowenstein, 165 Broadway, New York.

C. H. STUART & CO., INC., Newark, N. Y.; chemicals and chemical byproducts; 10,000 shares of stock, no par value. Incorporators: S. T. Knight, L. K. Stuart and P. D. Newton, all of Newark. Representative: Hubbell, Taylor, Goodwin & Moser, attorneys, Rochester, N. Y.

Industrial Notes

THE INDUSTRIAL WORKS at Bay City, Mich., has recently appointed C. D. Price as district sales manager of the St. Louis district, with headquarters at the Railway Exchange Bldg., St. Louis, Mo. Mr. Price has been connected with the company for many years.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO., of St. Louis, Mo., announces the removal of its San Francisco offices, showrooms and warehouse to new and more adequate quarters at 415 5th St. Oliver J. Williams is Pacific sales manager.

THE INGERSOLL-RAND CO., 11 Broadway, New York, N. Y., announces that L. D. Albin, formerly general sales manager of the company, has been elected vice-president in charge of European sales. D. C. Keefe, formerly assistant general sales manager, has been appointed to succeed Mr. Albin as general sales manager.

GEORGE R. STOETTNER, of New York, has resigned as vice-president of the Atlantic Dyestuff Co. and has organized a new company of which he will be president, to be known as the Algon Color & Chemical Corporation, with local headquarters.

THE PITTSBURGH TESTING LABORATORY announces the occupancy of its new laboratories and office building, located on Stevenson St. at Locust, Pittsburgh, Pa.